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ERRATUM.

On page 275, the paragraph beginning with the words "The physical circumstances" should follow immediately the paragraph ending with the words "the pyloric valve" on page 274, and form part of Mr. Macallum's paper on "The Alimentary Canal in Ganoid Fishes."

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Prof. W. H. Ellis, M. A., M. B	1884-85
W. H. VanderSmissen, M. A.	1886-87

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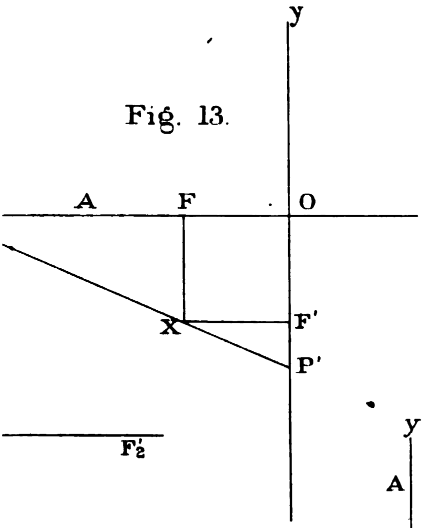

Fig. 13.

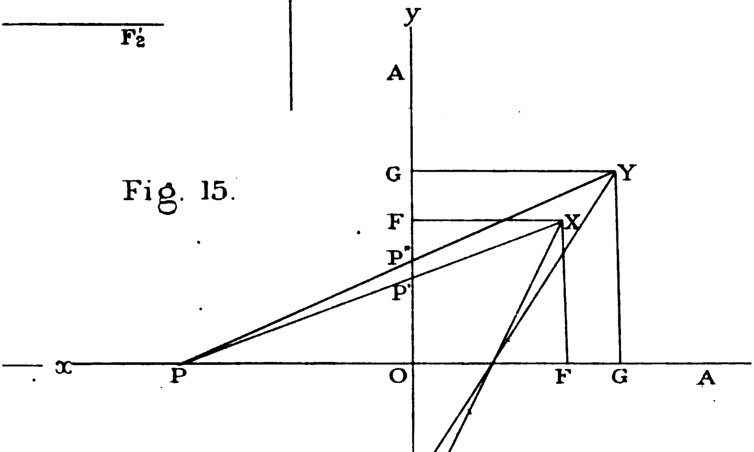

Fig. 15.

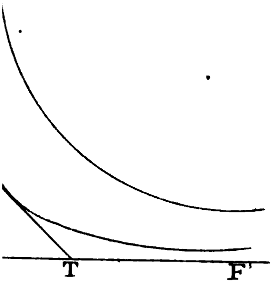

Fig. 14.

PROCEEDINGS

OF

THE CANADIAN INSTITUTE,

SESSION 1884.

FIRST ORDINARY MEETING.

The First Ordinary Meeting of the Session 1884-'85, was held on Saturday, November 1st., in the Lecture Room of the Institute, the Second Vice-President, Dr. George Kennedy, in the Chair.

The minutes of last ordinary meeting were read and confirmed.

The following list of donations and exchanges was read :

I.—CANADIAN.

1. **Proceedings and Transactions of the Nova Scotia Institute of Natural Sciences of Halifax, N.S.,** Vol. VI., No. 1, 1882-83.
2. **Report on Canadian Archives for 1883, by Douglas Brymner, Archivist.**
3. **The Canadian Practitioner, June, July, August, September and October, 1884, 5 numbers.**
4. **Second Annual Report of the Provincial Board of Health of Ontario for 1883, 2 copies.**
5. **Monthly Weather Review for May, June, July, August and September, 1884, 5 numbers.**
6. **The Canadian Entomologist,** Vol. XVI., Nos. 4, 5, 6, 7, April to July, **1884, 4 numbers.**
7. **Statutes of Ontario, 47th Victoria,** 1st Session, 5th **Legislature of Ontario held at Toronto, 25th July, 1884, 1 copy.**
8. **Manitoba Historical and Scientific Society :**
    (1) **Annual Report for the year 1883-84.**
    (2) **Transactions, No. 3, season 1883-84.** Notes and Comments on **Harmon's Journal, 1800-1820,** by Rev. Prof. Bryce.
    (3) **Transactions, No. 4. Fragmentary Leaves from the Geological Records of the Great North-West, by J. Hoyes Panton, M.A.**

(4) Transactions, No. 5, season 1883–84. "Our Water Supply," by Dr. Agnew.

(5) Transactions, 12, 13, 14. "The Red River," by W. Murdoch, Esq., C.E. "The Red River," by J. H. Rowan, Esq., C.E. "The Prairie Chicken," by Ernest E. T. Seton, Esq.

9. The Monthly Health Bulletin for Ontario, June, July and August, 3 numbers.
10. Inaugural Address delivered at the opening of the Law School in connection with Dalhousie University, Halifax, N.S., at the beginning of the first Term in 1883.
11. Report of the Meteorological Service of the Dominion of Canada, for the year ending December 31st, 1882, 2 copies.
12. Catalogue of the Central Circulating Library, Toronto, July 1st, 1884.
13. Ottawa Field Naturalists' Club, Transactions, No. 5, Vol. II., No. 1.
14. Label List of Insects of the Dominion of Canada, compiled by the Natural History Society of Toronto.
15. The Canadian Record of Science, Vol. I., No. 1.
16. On the Development of Physiological Chemistry and its Significance for Medicine, by Prof. Felix Hoppe-Seyler, translated by T. Wesley Mills, Esq., M.A., M.D., McGill College, Montreal.

Total Canadian, 36 numbers.

II.—UNITED STATES EXCHANGES.

1. Reports of the Peabody Museum of American Archaeology and Ethnology in connection with Harvard University, Vol. I., 1868–1876. Vol. II., Nos. 1, 2, 3, 4, 1877–80. Vol. III., Nos. 1, 2, 3, 4, 1881–84, 9 numbers.
2. Science Record, Vol. II., Nos. 7, 10, 11, 3 numbers.
3. Science, No. 68–90, 23 numbers.
4. Harvard University Bulletin for May, 1884, No. 28.
5. Proceedings of the Boston Society of Natural History, Vol. XXII., Part III.
6. Journal of the Franklin Institute for June, July, August, September and October, 1884, 5 numbers.
7. Annals of the New York Academy of Science, Vol. III., Nos. 1 and 2, 3 and 4, 2 numbers.

   Transactions of the New York Academy of Science, Vol. II., 1882–83.
8. Proceedings of the Academy of Sciences of Philadelphia, Part I., January to April, 1884.
9. Papers Concerning Early Navigation on the Great Lakes, by William Hodge. (From the Buffalo Historical Society).
10. Seventeenth Annual Report of the Peabody Institute of the City of Baltimore, June 1st, 1884.
11. Proceedings of the American Academy of Arts and Sciences. The Phases of the Moon, by Arthur Searle, April 9th, 1884.
12. The Workshop Companion, New York, 1879.
13. Preparation and Use of Concrete and Glue, New York, 1881.
14. Hints and Practical Information for Cabinet Makers, Upholsterers and Furniture men generally, New York, 1884.
15. Essex Institute Historical Collections for January, February and March, 1884, 1 number.

16. Bulletin of the Essex Institute :
    Vol. 15, Nos. 1-6, January to June, 1883.
    " 16, " 1-3, January to March, 1884, 3 numbers.
17. Appleton's Literary Bulletin, July, 1884.
18. Transactions of the Academy of Sciences of St. Louis, Vol. IV., No. 3, 1884.
19. United States Coast and Geodetic Survey. Report for the year ending June, 1882.
20. Bulletin of the Museum of Comparative Zoölogy at Harvard College, Vol. XI., No. 10.
21. Proceedings of the Newport Natural History Society for 1883-84.
22. Transactions and Proceedings of the American Society of Civil Engineers :
    Proceedings, Vol. X.
    Transactions, Vol. XIII., January to July, 1884.
    " August, 1884, 8 numbers.
23. Proceedings of the American Antiquarian Society, N. S., Vol. III., Part 2, April 1884.
24. Mineral Resources of the United States, by Albert Williams, jun., of the U. S. Geological Survey.
25. First Annual Report of the U. S. Geological Survey for the year ending June 30th, 1880.
26. Annual Report of the Board of Regents of the Smithsonian Institution for 1882.
27. Bulletin of the United States National Museum, No. 25. Contributions to the Natural History of the Bermudas, Vol. 1.
28. The Artesian Wells of Denver. (From the Colorado Scientific Society).

Total United States, 75 numbers.

III.—BRITISH EXCHANGES.

1. Transactions and Proceedings of the Botanical Society of Edinburgh, Vol. XV., Part 1, 1884.
2. Journal of the Anthropological Institute of Great Britain and Ireland, Vol. XIII., No. 4.

   Journal of the Anthropological Institute of Great Britain and Ireland, Vol. XIV., No. 1.
3. Proceedings of the Society of Antiquaries of Scotland, Vol. IV., N. S., 1881-82.

   Proceedings of the Society of Antiquaries of Scotland, Vol. V., N. S., 1882-83.

   Also to complete the set :
    Vol. I., Parts 1, 2 and 3, 1851-54.
    Vol. II., Parts 1 and 3, 1854-57.
    Vol. V., Part 2, 1863-64.
    Vol. IX., Part 1, 1870-71.
    Vol. XI., Part 2, 1875-76.
    Vol. XII., Parts 1 and 2, 1876-78. 12 numbers.
4. Journal of the Transactions of the Victoria Institute, Vol. XVIII., Nos. 69 and 70.

5. Archaeologia Aeliana, Vol. X., No. 1, N. S.
6. Proceedings of the Royal Geographical Society, N. S., Vol. 6, Nos. 6, 7, 8, 9 and 10, June to October, 5 numbers.
7. Proceedings of the Society for Psychical Research, Parts 1 to 5.
8. Journal of the Royal Microscopical Society, Series II., Vol. IV., Parts 3, 4 and 5, June to October, 3 numbers.
9. Minutes and Proceedings of the Institution of Civil Engineers, Vol. 76.
   " " " " " " Vol. 77.
10. Journal of the Quekett Microscopical Club, Series II., Vol. 1, Nos. 1–9, March, 1882, to July, 1884.
11. Trübner's American, European and Oriental Literary Record, Nos. 197 to 200.
12. Annual Report of the Leeds Philosophical and Literary Society, for 1883–84.
13. Monthly Notices of the Royal Astronomical Society, Vol. XLIV., Nos. 1 to 8, November, 1883, to June, 1884.
14. Proceedings of the Royal Colonial Institute, Vol. XV., 1883–84.
15. Transactions of the Manchester Geological Society, Vol. XVII., Parts 16, 17 and 18.
16. Memoirs of the Literary and Philosophical Society of Manchester :
    - 2 Series, Vol. II.
    - 3 Series, Vols. VII and VIII.
    - Proceedings of same Society, Vol. XX., 1880–81.
    - " " " Vol. XXI., 1881–82.
    - " " " Vol. XXII., 1882–83.

Total Great Britain and Ireland, 63 numbers.

IV.—BRITISH COLONIES (EXCLUSIVE OF CANADA).

1. Papers and Proceedings of the Royal Society of Tasmania for 1882.
2. Records of the Geological Survey of India, Vol. XVII., Parts 2 and 3.
   Memoirs of the Geological Survey of India, Vol. XX., Parts 1 and 2.
   Palæontologia Indica :
    - Series X., Vol. III., Part 1.
    - " " " 2.
    - " " " 3.
    - Series XIV., Vol. 1-3, Fas. III.
3. Proceedings of the Asiatic Society of Bengal, No. II., February, 1884.
   " " " " " Nos. III., IV., and V., March to May, 1884.
   Journal of the Asiatic Society of Bengal, Vol. LII., Part I., Nos. 1, 2, 3 and 4, 1883.
    - Vol. LIII., Part I., No. 1, 1884.
    - Vol. LIII., Part II., No. 1, 1884.
4. Transactions and Proceedings of the New Zealand Institute for 1883, Vol. XVI.
5. Journal of the Royal Society of New South Wales for 1882, Vol. XVI.

Total British Colonies, 20 numbers.

V.—FOREIGN EXCHANGES.

1. Mittheilungen der Anthropologische Gesellschaft in Wien, XIV. Band, 1 Heft, 1884.
2. Atti del Società Toscana di Scienze Naturali :
   Memoirs, Vol. VI., Fas. 1, Processi Verbali. Indici dei Volumi II., III. and IV., pp. 53 to 70.
3. Mémoires et Compte Rendu des Travaux de la Société des Ingénieurs Civils, Mars, Avril et Mai, 1884.
4. Mémoires de la Société Royale des Antiquaires du Nord, N. S., 1880.
5. Revista Trimensal do Instituto Historico Geographico e Ethnographico do Brazil, Tomo XLVI., Parte 1 e 2.
6. Correspondenz-Blatt der Deutschen Gesellschaft für Anthropologie, Ethnologie, und Urgeschichte, XV. Jahrgang, for April, May, June, July and August, 1884, 5 numbers.
7. Oversigt over det K. Danske Videnskabernes Selskabs Forhandlinger, 1883.
   Bulletin, No. 3, October to December, 1884.
   Bulletin, No. 4, January to March, 1884.
8. Le Globe, Tome III. :
   Bulletin, No. 1.
   Bulletin, No. 2.
   Mémoires, Septembre, 1884.
9. Bulletin de la Société Géologique de France :
   3 Série t. X., No. 7, Feuilles 33–44, 1882.
   " t. XI., No. 8, " 40–48, 1883.
   " t. XII., No. 7, " 26–32, 1884.
10. Astronomische, Magnetische und Meteorologische, Beobachtungen an der K. K. Sternwarte, zu Prag, 1883.
11. Boletin de la Academia Nacional de Ciencias in Cordoba (Republica Argentina), Tomo VI., Entrega 1*a*, 1884.
12. Verhandlungen der Berliner Gesellschaft für Anthropologie, Ethnologie und Urgeschichte, Sitzung vom 19 Januar, 1884.
    Sitzung vom 16 Februar ; vom 15 März und 19 April, 4 numbers.
13. Archivio per L'Antropologia e la Etnologia e Psicologia Comparata, Quattordicesimo Volume, Firenze, Fasicolo Primo, 1884.
14. Ymer Tidskrift Utgifven af Svenska Sällskapet för Anthropologi Och Geografi, 1884, 1 to 4 Häftet.
15. Archives Néerlandaises des Sciences Exactes et Naturelles, Vol. XIX., No. 2.
    Do., to complete a set :
    Tomes I. to VIII.
    " IX., Livraisons, 1, 2, 3.
    " XIII., " 4, 5.
    " XVI., " 3, 4, 5.
    " XVIII., " 2, 3, 4, 5.
    " XIX., " 1.
16. Bulletin de la Société d'Anthropologie de Paris, Tome Septieme (III. Série) 1 and 2, Fascicules, Janvier à Mars, 1884, et Mars à Mai, 1884.

17. Bulletin de la Société Royale de Botanique de Belgique, Tome Vingt-deuxième.
18. Sitzungsberichte der Naturforschende Gesellschaft zu Leipzig, Neunter Jahrgang, 1882, und Zehnter Jahrgang, 1883.
19. Arbók hins Islenzka Fornleifafélags, 1883, (Icelandic Archaeological Society) Reykjavik, 1884.
20. Verhandlungen der Naturhistorischen Vereines der Preussischen Rheinlande und Westfalens.
    - Vierzigster Jahrgang, Zweite Hälfte.
    - Ein und vierzigster Jahrgang, Erste Hälfte, Bonn, 1883–84.
21. Allgemeine Grundzüge der Ethnologie, von Prof. Dr. Adolf Bastian, Berlin, 1884.
22. Archives du Musée Teyler, Série II., Vol. I., Quatrième Partie.
23. Programme de la Société Hollandaise des Sciences à Harlem, 1883.
24. Verhandlungen der K. K. Zoologisch-Botanische Gesellschaft in Wien, Jahrgang 1883, Band XXXIII.
25. Brasilische Säugethiere Beiheft zu Band XXXIII.
26. Mittheilungen der K. K. Geographischen Gesellschaft in Wien, 1883, XXVI. Band.
27. Nachrichten von der K. Gesellschaft der Wissenschaften und der Georg Augusts Universität zu Göttingen, 1883, 1 to 13.
28. Dreiundzwanzigster Bericht der Oberhessischen Gesellschaft für Natur und Heilkunde, Giessen im Juni, 1884.
29. Jahrbuch der K. K. Geologischen Reichsanstalt, Jahrgang 1883, XXXIII. Band.
    - No. 4, October, November und December.
    - Do., Jahrgang 1884, XXXIV. Band, Hefte 1, 2, 3, Wien, 1884.
30. Sitzungsberichte der philosophisch-philologischen und historischen Classe der K. B. Akademie der Wissenschaften zu München, 1883, Hefte 1, 2, 3, 4.
31. Sitzungsberichte der mathematisch-physikalischen Classe der K. B. Akademie der Wissenschaften zu München, Hefte 1, 2, 3.
32. Anales del Museo Nacional de México, Tomo III., Entrega 6*a*.
33. Ueber Herkunft und Sprache der Transgangetischen Völker, Von Ernst Kulm.

Akademie der Wissenschaften zu München, am 25th Juli, 1881.

34. Gedächtnissrede auf Karl Von Halm, Von Eduard Wölfflin, 28 März, 1883.
35. Ueber die Methoden in der botanischen Systematik insbesondere die anatomische Methode, Von Ludwig Radlkofer, 25 Juli, 1883.
36. Schriften der physikalisch-ökonomischen Gesellschaft, zu Königsberg, vierundzwanzigster Jahrgang, 1883, Abtheilungen 1 und 2.
37. Verhandelingen der K. Akademie van Wetenschappen, XXIII. Deel, Amsterdam, 1883.
38. Verslagen en Mededeelingen der K. Akademie van Wetenschappen. Adfeeling Natuurkunde. Tweede Reeks, Deel XVIII., Amsterdam, 1883.
39. Jaarboek van de K. Akademie van Wetenschappen, Amsterdam, 1882.
40. Verhandlungen der Gesellschaft für Erdkunde zu Berlin, Band XI., Nos. 1, 2, 3, 4, 5.

Total Foreign, 93 numbers.

Professor Young then read a paper on the "Solutions of Equations of the Fifth Degree." The object of the paper was, in the first place, to determine the criterion of the solubility of the quintic equation; and next, assuming the conditions of solubility to exist, to solve the equation.

A short discussion followed, in which Mr. Livingston and Prof. Galbraith took part.

Prof. J. Loudon also read a paper entitled :—

GEOMETRICAL METHODS CHIEFLY IN THE THEORY OF THICK LENSES.

1. In cases of reflection or refraction at a spherical surface, or a combination of spherical surfaces, or lenses, if F, F′ be the primary and secondary principal foci of the surface, lens, or combination, and (P, P′), (R, R′) pairs of conjugate points, it is known that

$$\frac{f}{p}+\frac{f'}{p'}=1 \quad . \; . \; . \; . \; . \; . \; . \; . \quad (1)$$

where $f = \mathrm{RF}$, $p = \mathrm{RP}$, $f' = \mathrm{R'F'}$, $p' = \mathrm{R'P'}$; and where the positive direction from R for f and p is opposite to, whilst that from R′ for f' and p' is the same as, the direction of the incident pencil.

Now since the relation (1) expresses the condition that the line $\frac{x}{p}+\frac{y}{p'}=1$ passes through the point (f, f'), it follows that if the coincident lines FRR′F′, FRR′F′ be separated so that R on the x or object-axis coincides with R′ on the y or image-axis, the line joining P on the former to P′ on the latter will always pass through the fixed point (f, f'). Hence we derive a geometrical method for determining the point conjugate to any given one.

The points R, R′ from which distances are measured, it is to be observed, are any two conjugate points, such, for example, as the principal points, or nodal points; and they may in particular cases coincide when they are self-conjugate.

It is proposed in the following paper to employ the method indicated chiefly in discussing certain propositions in the theory of thick lenses.

I.

2. In the case of refraction at a single spherical surface

$$\frac{f}{p}+\frac{f'}{p'}=1$$

where f, f' are the distances of the primary and secondary principal foci F, F′, and p, p' the distances of the object and image P, P′, from A, the point where the principal axis meets the sphere.

Let the standard case be that of refraction into a denser medium, whose surface is convex, the direction of the light being from left to right. Then drawing axes AF, AF′, and taking the point X (f, f'), as in Fig. 1, we see that the point conjugate to P on one axis is the intersection of PX with the other.

It appears from the figure that A is a self-conjugate point, as also O, FO being equal to FX.

3. From similar triangles PFX, XF′P′, it is immediately seen that

$$ff' = dd',$$

where PF $= d$, P′F′ $= d'$.

If the rule of signs (§ 1) be applied to the measurement of d, d' on the two axes, it is to be observed that they are of the same sign, both being negative, for example, in Fig. 1.

4. If P, P′ are conjugate points, as also Q, Q′, then drawing PXP′, QXQ′, as in Fig. 1, we have

$$dd' = (d + \mathrm{PQ})\,(d' - \mathrm{P'Q'})$$

which reduces at once to

$$-\frac{d}{\mathrm{PQ}} + \frac{d'}{\mathrm{P'Q'}} = 1.$$

This is of the form

$$\frac{d}{\mathrm{D}} + \frac{d'}{\mathrm{D'}} = 1 \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad , \quad . \quad (2)$$

where the distances d, D are measured from P, and d', D′ from its conjugate P′, the rule of signs being that already referred to in § 1.

5. Fig. 2 exhibits the construction adapted to formula (2). P in the x axis coincides with its conjugate P′ in the y axis, and the line joining any other two conjugate points (Q, Q′) on the two axes passes through the point (d, d').

If the origin be the self-conjugate point O, the centre of the sphere, the relation (2) becomes

$$\frac{f'}{p} + \frac{f}{p'} = 1,$$

where (Fig. 3) OF $= f'$, OP $= p$, &c.

As in § 3 we have $dd' = f'f$.

6. The following proposition which is employed by Helmholtz (*vide* Optique Physiologique, p. 72), I have modified by changing his notation and applying the rule of signs (§ 1), in order to exhibit the result of the elimination in a symmetrical form.

Let there be any number of spherical refracting surfaces whose principal foci are (F_1, F'_1), (F_2, F'_2), &c., and which cut the common principal axis in A, B, C, . . . Let (R_0, R_1), (R_1, R_2) . . . be pairs of conjugate points, such that $R_0F_1 = d_0$, $R_1F'_1 = d'_1$, . . . In like manner let (P_0, P_1), (P_1, P_2) . . . be any other set of conjugate points, such that $R_0P_0 = p_0$, $R_1P_1 = p'_1$, . . . Then by § 4

$$\frac{d_0}{p_0} + \frac{d'_1}{p'_1} = 1,$$

$$\frac{d_1}{p_1} + \frac{d'_2}{p'_2} = 1, \text{ \&c.}$$

Also by the rule of signs (§ 1) we have $p_1 = -p'_1$, $p_2 = -p'_2$, . . . Hence, on eliminating these quantities, the position of P_n, the point conjugate to P_0 with reference to the system, is determined from an equation of the form

$$\frac{f}{p_0} + \frac{f'}{p'_n} = 1 \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \qquad (3)$$

where $f = R_0F$, $f' = R_nF'$, F, F′ being the principal foci of the system.

The values of $\frac{f}{d_0}$ for 2, 3, 4 . . . refractions are, respectively,

$$\frac{d_1}{d_0 + d'_1}, \quad \frac{d_1d_2}{d_1d_2 + d'_1d_2 + d'_1d'_2}, \quad \frac{d_1d_2d_3}{d_1d_2d_3 + d'_1d_2d_3 + d'_1d'_2d_3 + d'_1d'_2d'_3}, \ldots$$

and the corresponding values of $\frac{f'}{d'_2}, \frac{f'}{d'_3}, \frac{f'}{d'_4}$, are

$$\frac{d'_1}{d_1 + d'_1}, \quad \frac{d'_1d'_2}{d_1d_2 + d'_1d_2 + d'_1d'_2}, \quad \frac{d'_1d'_2d'_3}{d_1d_2d_3 + \ldots}, \ldots$$

7. The construction of § 5 (Fig. 2) applies to equation (3), and from the figure we at once deduce, as in §§ 3, 4, the general relations

$$dd' = ff', \frac{d}{D} + \frac{d'}{D'} = 1.$$

The latter, it may be observed, also follows from (3), since R_0, R_n are *any* conjugate points.

8. The principal foci F, F′ of a system of two surfaces S_1, S_2 constituting a lens may be found as follows :—

Let (F_1, F'_1), (F_2, F'_2) be the principal foci of S_1 and S_2, which cut the principal axis in A, B, respectively, so that $AF_1 = f_1$, $AF'_1 = f'_1, \ldots$ In Fig. 4 take the points $X_1 (f_1, f'_1)$ referred to A as origin, and $X_2 (f_2, f'_2)$ referred to B. Then since parallel rays on emergence from the system come from F_2, F_2 is the image of F in S_1. Therefore the line joining X_1 and F_2 on the y axis will cut the x axis in F.

Again, since parallel rays on incidence go to F'_1 and thence to F′, F′ is the image of F'_1 in S_2. Therefore the line joining X_2 and F'_1 on the x axis will give F′ on the y axis.

The principal foci of any system of surfaces may be determined in like manner.

9. In the case of a lens the distances AF, BF′ may be readily found as follows in terms of $f_1, f_2, \ldots$

From the similar triangles FAF_2, $X_1F'_1F_2$ (Fig. 4) we have

$$\frac{AF}{AF_2} = \frac{F'_1X_1}{F'_1F_2}, \text{ that is } \frac{AF}{f_2 - e} = \frac{f_1}{f'_1 + f_2 - e},$$

where $AB = e$.

Also from the similar triangles $F'BF'_1$, $X_2F_2F'_1$

$$\frac{BF'}{BF'_1} = \frac{F_2X_2}{F_2F'_1}, \text{ or } \frac{BF'}{f'_1 - e} = \frac{f'_2}{f'_1 + f_2 - e}.$$

These values can also be deduced from the relation of § 3. Thus, taking the x axis of the figure,

$$F_1F \,.\, F'_1F_2 = f_1 f'_1, \text{ \&c.}$$

10. In the system referred to in § 6 the lengths of the images $(\omega_1, \omega_2 \ldots)$ which an object ω_0 at R_0 produces at R_1, $R_2 \ldots$ may be determined as follows :—

Let O_1 be the centre and f_1, f'_1 the principal focal lengths of S_1, &c.

Then (Fig. 5)

$$\frac{\omega_1}{\omega_0} = \frac{O_1R_1}{O_1R_0} = \frac{F_1X}{F_1R} = \frac{f_1}{d} = \frac{d}{f}$$

In like manner,

$$\frac{\omega_2}{\omega_1} = \frac{f}{d} = \frac{d'_2}{f}, \text{ \&c.}$$

From these relations we find

$$\frac{\omega_2}{\omega_0} = \frac{d'_1 d'_2}{f'_1 f'_2} = \frac{f_1 f_2}{d_0 d_1},$$

$$\frac{\omega}{\omega_0} = \frac{d'_1 d'_2 d'_3}{f'_1 f'_2 f'_3} = \frac{f_1 f_2 f_3}{d_0 d_1 d_2}, \text{ \&c.}$$

Hence if $\omega_0 = \omega_n$, each of the nth equalities becomes equal to 1, and the points R_0, R_n the principal points of the system.

Thus, if $n = 2$, $d_0 d_1 = f_1 f_2$, and $d'_1 d'_2 = f'_1 f'_2$.

Also, since $AR_1 = f'_1 - d'_1$, $BR_1 = f_2 - d_1$, we have

$$d_1 + d'_1 = f'_1 + f_2 - e;$$

and the values of the principal focal lengths become

$$f = \frac{f_1 f_2}{f'_1 + f_2 - e}, \quad f' = \frac{f'_1 f'_2}{f'_1 + f_2 - e}.$$

11. Now let R, R′ be the principal points, F, F′ the principal foci of a thick lens; so that we have

$$\frac{f}{p} + \frac{f'}{p'} = 1. \quad . \quad . \quad . \quad . \quad . \quad . \quad (4)$$

Fig 6, in which X is the point (f, f'), exhibits the method of finding the conjugate of a given point.

12. Conjugate points will be nodal points N, N′ when on the x axis we have NN′ = RR′. This will evidently happen when (Fig. 6) the line through X makes FN = FX. RN $(= f' - f)$ on the x axis will then be equal to R′N′ on the y axis.

If distances are measured from the nodal points N, N′, equation (4) becomes $\frac{f'}{p} + \frac{f}{p'} = 1$, in which f', p are measured from N, and f, p' from N′; and the conjugate points are determined as in Fig. 7.

13. These figures make the existence of self-conjugate points manifest. Thus in Fig. 7, if S is such a point, we have

$$FS.\ F'S = ff', \quad FS + F'S = FF' = 2h.$$

Hence FS, F′S are the roots of $s^2 - 2hs + ff' = 0$, and the self-conjugate points are at equal distances from F, F′.

14. Fig. 8 exhibits the construction when one of the self-conjugate points is taken as origin.

From the similar triangles PP′P, S′P′X, and also PSP, FSF, we obtain the relations

$$\frac{PSP'}{S'P} = \frac{PP}{S'X} = \frac{PP}{FF} = \frac{SP}{SF}.$$

15. If F is the image of K, and K′ of F′, then on the x axis of Fig. 8 we have

$$FK \,.\, FF' = FS \,.\, F'S = FF' \,.\, F'K'$$

Hence

$$FK = F'K' = \frac{ff'}{2h}.$$

Also, if T, T′ are conjugates such that $FT = F'T'$, then

$$FT^2 = FT \,.\, F'T' = ff'.$$

It thus appears that the middle point of FF′ also bisects the lines KK′, SS′, RN′, R′N, TT′ and (*vide* § 28) VV′.

16. The method of § 6 may be applied as follows to a system of lenses.

Let there be any number of lenses L_1, L_2, . . . whose principal foci are (F_1, F'_1), (F_2, F'_2) . . . , and whose principal planes cut the common axis in (A, A′), (B, B′) . . .

Let (R_0, R_1), (R_1, R_2) . . . be pairs of conjugate points such that $R_0F_1 = \delta_0$, $R_1F'_1 = \delta'_1$, $R_1F_2 = \delta_1$, . . . In like manner let (P_0, P_1), (P_1, P_2), . . . be any other set of conjugate points such that $R_0P_0 = p_0$, $R_1P_1 = p'_1$, . . .

Then (§ 7)

$$\frac{\delta_0}{p_0} + \frac{\delta'_1}{p'_1} = 1,$$

$$\frac{\delta_1}{p_1} + \frac{\delta'_2}{p'_2} = 1, \text{ \&c.};$$

from which by eliminating $p_1 = -p'_1$, $p_2 = -p'_2$, . . . we get an equation of the form

$$\frac{f}{p_0} + \frac{f'}{p'_n} = 1,$$

where $f = R_0F$, f', $= R_nF'$, F,F′ being the principal foci of the system.

17. The principal foci F, F′ of a system of lenses may be determined geometrically as in § 8.

Thus, let there be two lenses L_1, L_2, whose principal foci are (F_1, F'_1), (F_2, F'_2), and principal points (R_1, R'_1), (R_2, R'_2). Then (Fig. 9), since parallel rays on emergence come from F_2, F_2 is the image of F in L_1. Hence the line joining X_1 and F_2 on the y axis gives F on the x axis.

Again, since parallel rays on incidence go to F'_1, and thence to F', F' is the image of F'_1 in L_2. Hence the line joining X_2 and F'_1 on the x axis gives F' on the y axis.

In the construction, of course, any pairs of conjugate points may be employed instead of the principal points.

18. In the system of § 16 the lengths of the images $(\omega_1, \omega_2 \ldots)$ which an object ω_0 at R_0 produces may be determined as follows :—

Let (f_1, f'_1), $(f_2, f'_2) \ldots$ be the principal focal lengths of L_1, $L_2 \ldots$

Then, since (§ 20) in a thick lens the ratio of the lengths of object and image is that of their respective distances from the nodal points, we have (Fig. 10),

$$\frac{\omega_1}{\omega_0} = \frac{N'_1R_1}{N_1R_0} = \frac{F_1X}{F_1R_0} = \frac{f_1}{\delta_0} = \frac{\delta'_1}{f'_1}.$$

In like manner we have

$$\omega_2 = \omega_1 \frac{f_2}{\delta_1} = \omega_1 \frac{\delta'_2}{f'_2}$$

$$= \omega_0 \frac{f_1 f_2}{\delta_0 \delta_1} = \omega_0 \frac{\delta'_1 \delta'_2}{f'_1 f'_2}\text{; \&c.}$$

Hence if $\omega_0 = \omega_n$, R_0, R_n become the principal points of the system, and

$$\delta_0 \delta_1 \ldots = f_1 f_2 \ldots$$

$$\delta'_1 \delta'_2 \ldots = f'_1 f'_2 \ldots$$

19. The equation for the system of lenses being $\dfrac{f}{p} + \dfrac{f'}{p'} = 1$, referred to principal points, the corresponding equation, when the nodal points are origins, becomes $\dfrac{f'}{p} + \dfrac{f}{p'} = 1$, in which f', p are measured from N, and f, p' from N'.

20. The lengths of object and image at various pairs of conjugate points may now be compared.

Thus (Fig. 7), if ω at P gives ω' at P', we have †

$$\frac{\omega + \omega'}{\omega'} = \frac{PR}{RF} = \frac{PF}{RF} + 1.$$

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† *Vide* Croullebois, *Lentilles épaisses*, p. 32.

Therefore

$$\frac{\omega}{\omega'}=\frac{\mathrm{PF}}{\mathrm{FX}}=\frac{\mathrm{PN}}{\mathrm{P'N'}},$$

the relation on which is based the definition of nodal points.

It would seem preferable, however, after having proved the existence of nodal points †, to reverse these steps, and from $\frac{\omega}{\mathrm{PN}}=\frac{\omega'}{\mathrm{P'N'}}$, to deduce $\frac{\omega}{\omega'}=\frac{\mathrm{PF}}{\mathrm{FX}}$, &c.

21. Again, if ω at N gives ω' at N′,

$$\frac{\omega f}{\mathrm{RN}}=\frac{\omega' f'}{\mathrm{R'N'}}.$$

Therefore

$$\frac{\omega}{f'}=\frac{\omega'}{f},$$

that is, the apparent magnitude of ω at F is equal to that of ω' at F′.

22. If ω at S gives ω' at S, then (Fig. 7) from the similar triangles SNS, SF′X, XFS we have

$$\frac{\omega}{\omega'}=\frac{\mathrm{NS}}{\mathrm{N'S}}=\frac{f'}{\mathrm{SF'}}=\frac{\mathrm{SF}}{f}.$$

In like manner if ω at S′ gives ω'' at S′ we have

$$\frac{\omega}{\omega''}=\frac{\mathrm{SF'}}{f}=\frac{f'}{\mathrm{SF}}.$$

Hence from the last two relations

$$\frac{\omega}{f'}=\frac{\omega'}{\mathrm{SF'}}=\frac{\omega''}{\mathrm{SF}}.$$

23. If ω at K gives ω' at F, and ω at F′ gives ω'' at K′, then (Fig. 7)

$$\frac{\omega}{\omega'}=\frac{\mathrm{NK}}{\mathrm{N'F}}=\frac{\mathrm{F'X}}{\mathrm{F'F}}=\frac{f'}{2h},$$

and

$$\frac{\omega}{\omega''}=\frac{\mathrm{NF'}}{\mathrm{N'K'}}=\frac{\mathrm{FF'}}{\mathrm{FX}}=\frac{2h}{f}.$$

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† *Vide* Helmholtz, *Optique physiologique*, p. 75.

II.

24. The geometrical method of the preceding sections may also be extended to the case of reflection at one or more spherical surfaces. A few examples will suffice to illustrate the method.

Thus for a convex mirror F and F′ are coincident; f is negative and f' positive, and formula (1) becomes

$$-\frac{f}{p}+\frac{f}{p'}=1.$$

Hence the line joining conjugate points on the two axes passes through X $(-f, f)$, as in Fig. 11.

For a concave mirror the formula is

$$\frac{f}{p}-\frac{f}{p'}=1,$$

and X is $(f, -f)$, as in Fig. 12.

25. In either case we have, from the similar triangles PFX, XF′P′ (Fig. 11 or 12),

$$\frac{\mathrm{PF}}{\mathrm{FX}}=\frac{\mathrm{F'X}}{\mathrm{P'F'}},$$

that is

$$dd'=f^2,$$

which is Newton's formula.

If d and d' be measured respectively from P and P′ in accordance with the rule of signs (§ 1), this formula should be written

$$dd'=-f^2,$$

as appears by deducing it from the relation $dd'=ff'$ of § 3.

26. The relation between the lengths of the object and image is most readily obtained by making the axes cross at O, the centre of the mirror.

Thus for a convex mirror we have (Fig. 13)

$$\frac{\omega'}{\omega}=\frac{\mathrm{OP'}}{\mathrm{OP}}=\frac{\mathrm{FX}}{\mathrm{PF}}=\frac{f}{d}.$$

In the case either of a convex or a concave mirror it may be remarked that, if account be taken of the signs of f, f', d, d', the relation

$$\frac{\omega'}{\omega}=\frac{f}{d}=\frac{d'}{f'},$$

determines whether the image is erect or inverted, the sign of $\frac{\omega'}{\omega}$ being positive in the former case, and negative in the latter.

27.* The method may also be applied to determine the spherical aberration of mirrors.

Thus in the case of a concave mirror if distances are measured from the centre O, and if the incident ray PI is reflected at I so as to cut the axis after reflection in P″, we know that

$$-\frac{f\sec a}{p}+\frac{f\sec a}{p''}=1,$$

where a is the angle AOI, OP $= p$, and OP″ $= p''$.

But, P′ being conjugate to P, we have

$$-\frac{f}{p}+\frac{f}{p'},=1,$$

where OP′ $= p'$.

Hence, if the separated axes cross at O, as in Fig. 15, whilst PP′ always passes through X $(-f, f)$, PP″ always passes through Y $(-f\sec a, f\sec a)$. P′P″ on the y axis will accordingly represent the longitudinal aberration, whose direction is seen from an inspection of the figure to be from O to A except when P lies between F and G.

The value of the aberration may be determined by comparing the similar triangles POP′, PFX, POP″, PGY. Thus

$$\frac{\mathrm{P'P''}}{p}=\frac{p''-p'}{p}=\frac{f\sec a}{p+f\sec a}-\frac{f}{p+f},$$

whence we get $\mathrm{P'P''}=\frac{p^2f(1-\cos a)}{(p+f)(p\cos a+f)}$, the ordinary expression.

If PF $= d$, and PG $= \triangle$, we also have

$$\frac{p''-p'}{p}=\frac{\triangle-p}{\triangle}-\frac{d-p}{d}$$

$$=\frac{p}{d}-\frac{p}{\triangle}.$$

Therefore $p''-p'=p^2\left(\frac{1}{d}-\frac{1}{\triangle}\right)$.

It may be remarked that FG is the principal longitudinal aberration, and that the figure also gives the relation $\triangle\triangle' = f^2 \sec^2 a$, where $\triangle' = P''G$.

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* This section was added December, 1884.

In the case of a convex mirror X and Y will lie in the opposite quadrant and the longitudinal aberration will be found to be

$$p^2\left(\frac{1}{\triangle} - \frac{1}{d}\right).$$

III.

28. Since writing the above it has occurred to me that the relation $dd' = ff'$ leads to two other simple geometrical methods for exhibiting the relations between the conjugate points.

Thus if we separate the two axes FF′, FF′ so that F in the x axis coincides with F′ in the y axis, as in Fig. 14, then evidently the feet of the ordinates drawn from any point on the hyperbola $xy = ff'$ will be conjugate to one another. This construction gives us a readier means of finding many of the points whose positions have already been discussed.

Thus self-conjugate points are at once given by

$$x\ (2h - x) = ff'\,;$$

and the points K, K′ (§ 15) by

$$2hx = ff'.$$

Again, H being the middle point of FF′, if H is the image of G, and J of H, we have

$$F'J = \frac{ff'}{h} = 2FK = FG.$$

29. From the construction of the preceding section it appears that the lines joining pairs of conjugate points on the two axes touch the hyperbola

$$4xy = ff'.$$

Fig. 14 shows that the conjugate points V, V′ are equidistant from H, the middle point of FF′, and that

$$FV = F'V' = FT = \sqrt{ff'}.$$

Prof. Galbraith, Mr. Wm. Houston, and Mr. A. Baker took part in the discussion which followed.

SECOND ORDINARY MEETING.

The Second Ordinary Meeting of the Session 1884-'85, was held on Saturday, November 8th, the President, Prof. W. H. Ellis, in the Chair.

The minutes of last meeting were read and confirmed.

The following gentlemen were elected members of the Institute :—

T. J. Mulvey, B.A., T. A. Haultain, B.A., H. R. Wood, B.A., J. H. Bowes, B.A., Charles Whetham, B.A., J. C. Smoke, M.A., Geo. G. S. Lindsey, B.A., F. C. Mensinga, Esq., W. Dale, M.A., W. A. Frost, B.A., Geo. Inglis, B.A., John Nairn, Esq., J. D. Barnett, Esq., D. H. Talbot, Esq., Prof. T. Nelson Dale, Rev. George Burnfield, M.A.

The following list of donations and exchanges received since last meeting was read :

1. The Canadian Practitioner for November, 1884.
2. Science, Vol. IV., No. 91, October 31st, 1884.
3. Science Record, Vol. II., No. 12, October 15th, 1884.
4. Journal of the Franklin Institute for November, 1884.
5. Proceedings of the Cambridge Philological Society, Vols. VII. and VIII., Lent and Easter Terms, 1884.
6. Bulletin de la Société d'Anthropologie de Paris, Tome Septième (III*e* Serié) 3*e* Fascicule, Mai à Juillet, 1884.

Prof. T. Nelson Dale then read the following paper :—

ON METAMORPHISM IN THE RHODE ISLAND COAL BASIN.

Sir Charles Lyell, in a paper read before the Geological Society of London in 1844, called the attention of British Geologists to the occurrence near Worcester, in Massachusetts, of a bed of Plumbago and Anthracite, which he was inclined to believe belonged to the Carboniferous Formation.* The Geological Survey of Rhode Island by Dr. Jackson, published in 1840, that of Massachusetts by President Edward Hitchcock in 1841, a short paper by the same on the Rhode Island coal field in 1853, as well as two papers by his son,

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* Ch. Lyell, On the probable age and origin of a bed of Plumbago and Anthracite occurring in Mica-schist near Worcester, Mass.—Quarterly Journal of the Geological Society of London, Vol. I., 1845. See also on the Worcester beds the following paper, which has appeared since mine was read. Joseph H. Perry, Note on a Fossil Coal Plant found at the Graphite deposit in Mica-schist, at Worcester, Mass.—American Journal of Science, Vol. XXIX., p. 157, Feb., 1885.

Prof. Ch. H. Hitchcock, in 1860, have clearly established the fact that there extends from the vicinity of Worcester, Mass., to the southern extremity of Rhode Island, a more or less broken belt of rocks of Carboniferous age; and these writers all concur in describing these rocks as materially different from those of the best known coal fields. Instead of Bituminous coal or of Anthracite, we find there a plumbaginous Anthracite; instead of the accompanying clays and clay-slates, we find clay-slates and Mica-schists. The southern portion of the belt, at least, is traversed by numerous Quartz veins, and all the rocks and minerals of the region indicate varying degrees of metamorphism. During the last few years the writer has devoted considerable time to the construction of a geological map of the vicinity of Newport, R. I., and of a geological section across the entire basin, which at that point measures some fifteen miles in width. Since the publication of the results of this work, in extending during last summer the observations northwards, I came upon a locality where the metamorphism of the coal-measures had proceeded further than it is supposed to have done even in that region. The object of this paper is to give a brief statement of these observations.

[In order, however, to show their general bearing the following condensed summary of the writer's former papers on the stratigraphy of the vicinity of Newport is here given.* On either side of the basin we have areas of Protogine and Gneiss (A), and in the centre two isolated masses of stratified Protogine. Closely allied to this we have on the west side of the basin a long strip of Mica-schist (B), some of which contains rounded quartz pebbles, and is traversed both horizontally and vertically by veins of Granite. Not far from the juncture of the Gneiss and Mica-schist is a bed of granular Plumbago. A and B may be of Montalban or even of Huronian age. Then follow certain beds of Hornblende, Chlorite and Mica-schist (C), and of Epidote and Chlorite-schist (D), which may be synchronous. A series of strata similar to C, and probably of Silurian age, occurs in Connecticut.†

The next series (E) consists of Chloritic Argillytes with passages of Calcite, nodules of Jasper and some thick layers of Dolomite. Its age is doubtful.

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* A contribution to the Geology of Rhode Island. Proceedings of the Boston Society of Natural History, Vol. XXII., Jan. 3rd., 1883. A contribution to the Geology of Rhode Island. American Journal of Science, Vol. XXVII., March and April, 1884. (In the Section on Pl. VI. of this paper the unconformity between the Coal-measures and the Protogine should probably have been represented rather as a thinning out of the Coal-measures in contact with Protogine beds of originally conformable stratification.) Remarks on some of the evidences of Geological disturbance in the vicinity of Newport. Proceedings of the Newport Natural History Society, 1883-4.

† See James D. Dana, On Rocks of Helderberg Era in the Valley of the Connecticut, etc. American Journal of Science, Vol. VI., p. 339, 1873.

Prof. T. S. Hunt, of Montreal, is disposed on chemical and lithological grounds to assign both this and the following to the Huronian. The next is a Siliceous Argillyte (F) passing into an impure Serpentine, with, however, some seams of Talc and Precious Serpentine. The relative age of this and the preceding series is difficult to make out. However, together with fragments of A, C, and E, it seems to have constituted an island some four miles in diameter in the midst of the Carboniferous marsh or estuary. All the rocks described above are presumably of Pre-Carboniferous age, and upon the different members of this series, for they do not seem to have been uniformly deposited, the Carboniferous rocks were laid down. The lowest bed of Carboniferous age is a conglomerate of fine Quartz pebbles with some argillaceous matter, metamorphosed into a dark, compact, siliceous rock, containing here and there a layer of black slate with *Annularia longifolia* (G). This probably belongs to the "Millstone Grit." The overlying bed is a Sideritic Argillyte (H)—a finely laminated slate generally with minute nodules of carbonate of iron with a crystalline structure. Then a thick bed of coarse conglomerate (I), the pebbles and boulders of which consist of a micaceous Quartzite, and contain in some localities Lingulæ. Minute crystals of Magnetite abound in the cement of this conglomerate. The pebbles are often coated with scales of Mica, and the shells of the Lingulæ are sometimes plumbaginous. Lastly, we have the Coal-measures proper consisting of alternating conglomerates, sandstones, clay slates and Mica-schists, together with several seams of plumbaginous Anthracite (J). About sixty species of coal plants occur in the slates of this series—mainly of the genera: Annularia, Calamites, Lepidodendron, Neuropteris, Odontopteris, Pecopteris and Sphenophyllum. The impressions are sometimes coated with Talc or Pyrite. The latest analysis of this coal[*] afforded the following extremes in nine analyses: Carbon 67—79 %, Ash 11—17 %, Volatile combustible 4½—7¼ %, Water 2¼—10¼ %. The Ash contains from 50—75 % of Silica. This coal, as stated by Dr. Emmons, possesses the property, after being dried at 115° Centigrade, of absorbing, when exposed to a N.W. wind, over 13 % its own weight of water, and, when placed over water, 22½ %. Veins of Quartz and of Asbestus traverse the coal seams.

The Pre-Carboniferous beds measure at least from 4,000 to 7,700 feet, the Carboniferous from 4,000 to 5,500, and in other parts of the basin perhaps 8,000 feet. All the beds have been folded parallel to the Appalachian chain, and the last flexure probably took place at the close of the Carboniferous Period. The beds were also flexed, though on a much smaller scale, in the opposite direction, indicating a pressure operating N.N.E.—S.S.W., as well as one W.N.W.—E.S.E.]

In the western part of the basin, along the West Passage of Narraganset Bay, the strata of the Coal-measures are much disturbed, being in places vertical or folded over upon themselves. In accordance with the geological law that regions of the greatest disturbance are generally those of the greatest metamorphism, it is not strange that the rocks of the West Passage are more metamorphic than those of other portions of this section of the basin. On the west shore of the Island of Conanicut the Coal-measures dip E.S.E. true, away from the west side of the basin, the nearest rocks to the west being the Mica-schist (B), which forms there the shore of the mainland. In examining the outcrops on the west shore of the northern portion of Conanicut, which, with occasional interruptions, extend some three miles or more, I noted the following section, beginning with the more recent strata:

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[*] Arthur B. Emmons, Notes on the Rhode Island and Massachusetts Coals. Transactions of the American Institute of Mining Engineers, Sept., 1884.

Mica-schist with Garnets, Staurolite, Ottrelite and Chlorite, 4 feet.

Plumbaginous Argillyte, with minute veins of Mica and coal ferns, 3 feet.

Mica-schist with Garnets, Staurolite, Ottrelite and Chlorite (including 2 feet of Plumbaginous-schist), 10 feet.

Several layers covered, but conformable.

Mica-schist with Garnets and Chlorite (including a few inches of Plumbaginous Argillyte), 3½ feet.

Quartzose Mica-schist (including 2 feet of Quartzyte with radiate Asbestus), 7 feet.

Plumbaginous Argillyte with Garnets and Chlorite, 2 feet.

Mica-schist with Garnets, Staurolite, Ottrelite and Chlorite, 8 feet.

The Staurolites occur as single crystals, twins of 60°, and drillings. The Garnets and Staurolites are generally partial pseudomorphs of Chlorite after Garnet or Staurolite.

If such highly crystalline Paleozoic rocks occur in one region they may elsewhere; and it would not be surprising if some metamorphic rocks, now regarded as of Azoic or Eozoic age, should be ultimately found to belong to the Paleozoic.

The President, Messrs. Notman, Shaw and Livingston made some observations on the subject of the paper.

THIRD ORDINARY MEETING.

The Third Ordinary Meeting of the Session 1884-'85, was held on November 15th, the President, Prof. Ellis, in the Chair.

The minutes of last meeting were read and confirmed.

The following list of donations and exchanges received since last meeting was read :

1. Science, Vol. IV., No. 92, for November 7th, 1884.
2. Transactions of the Linnean Society of New York, Vols. I. and II., December, 1882, to August, 1884.

The President, Prof. W. H. Ellis, then read his Inaugural Address :—

THE PRESIDENT'S ADDRESS.

This year will be marked in the scientific annals of Canada with a red letter. It has been rendered memorable by the visit of the British Association. Although a sober estimate of the effects produced or likely to be produced by this visit will in all likelihood fall short of what has been claimed by some enthusiasts, there can not be two opinions as to its importance. It marks an era in our country's development. We have shaken hands with our brethren across the sea, and the leaders of British science have recognized that we too are alive to the great work of the advancement of human knowledge, and not only willing but able to bear our part in it.

We may smile when we read in an English newspaper that "*in consequence* of the visit of the British Association to Canada twenty thousand dollars has been subscribed in Toronto to found a public library ;" but for all that we cannot fail to acknowledge that, setting aside exaggeration, the results of this visit must be of great importance—how great it is impossible to estimate.

The meeting will have a two-fold influence—an influence on our visitors and on ourselves. As to the effect upon the members of the British Association who made the voyage to Canada, and many of whom spent several weeks in travelling over the length and breadth of our land, we are scarcely in a position to speak, although we may feel confident that the intercourse that they have had under very favourable circumstances with a people of their own race—one with them in language, in religion, in allegiance, and in laws—

and yet exhibiting here and there those slight, often indeed indescribable, although readily appreciable, differences which inevitably follow the separation of a people from the parent stock cannot have been without interest. Interesting, too, must have been the spectacle of a race of Frenchmen, in whose past the Great Revolution has no place, to whom Voltaire is but a heretic, and to whom Napoleon is but a name of history—a people who unite with the shrewdness, the thrift and the lightheartedness of the Frenchman of to-day the simple faith of the Breton peasant of the middle ages.

As for the country itself, although the rawness unavoidable in a new country always produces an unpleasant effect upon those whose tastes have been formed in a land where the details have been wrought out by the labour of generations, and all unsightliness has been smoothed and toned away by the mellowing hand of time, yet there is such plain witness of wholesome strength, of plenty in the present and promise for the future, that the thoughtful visitor can well forgive faults which will be surely cured by time, and which time only can cure. But the exceeding loveliness of our woods and our waters may well atone for much that is crude and displeasing in our towns and settlements. Here one can praise without stint or qualification, if praise were not out of place among scenes where the fitting frame of mind is rather one of abandonment to the sweet influences of nature, and criticism, even in the form of the most appreciating commendation, seems to jar upon the ear.

It is always interesting to know how we seem to others. The American wants to see himself through English spectacles, and the Englishman is greatly interested in reading how he looks to a Frenchman. So we are naturally curious to find out how we appeared to our late guests. But, leaving this side of the question, the Montreal meeting ought to have, and will have, important influences upon ourselves. We have been brought into personal contact, or at least we have looked into the faces and listened to the voices of many of the foremost men of our race and time in every department of science. Names which to most of us were before but names have become living flesh and blood. Thinkers and investigators with whose minds, so far as they were set forth in their writings, we have long been familiar we have found to have not only minds but bodies. Henceforth they will be to us more than mere vague abstractions. They will have a living human personality, and our interest in their writings and in their work will be keener and more vivid.

To the student of science the value of this personal intercourse with those who have done and are doing great and lasting work is incalculable. It rouses his enthusiasm. It stimulates his ambition. It stirs his flagging energies, and wakes in his breast the aspiration to share with them, even if only in an humble way, the glorious work of searching out the truths of nature and thinking out the thoughts of God. It lifts him out of himself and the little circle of his own interests and cares and makes him feel himself a citizen of the great Commonwealth of Science—a soldier of the great army of workers whose aim is the discovery of truth.

The project of holding a meeting of the British Association in Canada was a bold one; and there were not wanting prophets of evil who, when it was first set on foot, were ready to throw cold water on it, and call it inadvisable if not impracticable. The length of time taken in going and returning, the discomforts of a long sea voyage, and the expense, would, it was said, prevent all but a few daring enthusiasts from taking part in it. It was feared also that the number of those in Canada who took enough interest in science to assist at the meetings would be small, and that only failure and disappointment would result from the attempt. Even if tempted by the inducement of a cheap excursion any considerable number of people could be induced to make the voyage, those whose presence would be most desirable on such an occasion would be absent, and if quantity was forthcoming quality would most certainly be inferior.

It is gratifying to know, as we do now, that these predictions were entirely groundless. In every respect the Montreal meeting of the British Association was a most successful one. The numbers attending the meeting were beyond all expectation; and these were not mere holiday seekers, but those really interested in the objects of the Association. The number of old annual and life members who attended the Montreal meetings was above the average.

The interest of the meetings of sections was also all that could be desired. The papers read, both as to number and character, were decidedly above the average, and the interest shown by the Canadian public was most satisfactory. In every respect those who planned and carried out the undertaking on both sides of the Atlantic have every reason to congratulate themselves upon the success that has crowned their endeavours. An experiment so successful will bear repetition; and in all probability some of us here to-night will have the pleasure of welcoming on some future occasion the members of the British Association to our own City of Toronto.

The British Association is now a little more than half a century old, having been established in 1831. The idea seems to have originated with Sir David Brewster, and to have been suggested to him by a German Science Congress, instituted eight years previously. The first meeting of the British Association was held at York, and the objects stated were :—

1. To give a stronger impulse and a more systematic direction to scientific enquiry.

2. To promote the intercourse of those who cultivate science in different parts of the British Empire with one another and with foreign philosophers.

3. To obtain a more general attention to the objects of science and a removal of any disadvantages of a public kind which impede its progress.

It is the latter object which is, perhaps, the peculiar distinction of the British Association. While other learned societies are either select philosophical clubs or associations of those interested in some special branch of science, the British Association is catholic in constitution and appeals directly to the public. It demands in its members no literary acquirements, no special scientific attainments, no other qualifications, in fact, than such a degree of interest in science as is shewn by the payment of its fees and the attendance on its meetings. It is not like the Royal Society, for example, a body of men eminent in their respective pursuits, into which entrance is strictly guarded, and whose membership is looked upon as a coveted honour comparable with that conferred by an order of knighthood. It is rather an Association of all those interested in the progress of science willing to aid in its advancement or anxious to learn its condition.

But, though it thus addresses itself to the people and welcomes all who care to come to its meetings, it has always numbered among its members the very brightest names on the roll of British Science, and to this fact it owes alike its dignity and its usefulness. In this respect, as in others, the late meeting has been well up to the mark, as the names, which will at at once occur to all of us, abundantly shew.

The popular character of the objects and constitution of the British Association is highly typical of the modern philosophy as distinguished from the ancient, or at any rate, from the mediæval. The old philosophers were cloistered recluses, living apart from their fellows, and hiding their knowledge from the vulgar, or only displaying it to dazzle or to scare. Their works were not only written in a tongue unintelligible to the many, but were couched in language studiously.obscure—a mystical jargon only understood by the initiated. Nowadays, each new discovery is at once communicated in clear and precise language, not only to those whose training has fitted them to understand the technicalities of science, but also so far as possible to the public. Indeed, many of the most gifted masters of experiment and research have in late years expended almost as much pains and labour in the popular exposition of the results of their investigations as they devoted to the investigations themselves. No sooner, too, has a new truth been discovered or a new law been established than a hundred acute minds are ready to seize upon it and turn it to practical utility—discovery and invention go hand in hand, and the door of the laboratory opens into the workshop.

It is in Italy that the germ of scientific associations first began to sprout, but England was not far behind, and there more than two centuries ago a little knot of earnest workers banded themselves together to form a Society the fame of which was destined to spread over the world, and on the model of which all subsequent scientific societies have been more or less constructed—the Royal Society of London, for the Promotion of Natural Knowledge.

The first President was Sir Robert Moray. The Society was soon incorporated under Royal Charter, and in 1663 a new charter was granted which is still the fundamental constitution of the Society. The first President under the new charter was Lord Browncker, the Chancellor to the Queen, and a mathematician of eminence, and among the members of the council appears the venerated name of Robert Boyle. Two years later appeared their first number of "Philosophical Transactions," as the papers published under the auspices of the Royal Society are still called, and the year 1671 was made memorable by the admission to the Fellowship of the Society of a young professor of mathematics, of Cambridge, who was destined to shed immortal lustre on the Society and on his country, under the name of Sir Isaac Newton. At a meeting held on the 28th of April, 1686, Newton presented his Principia, which, however, the Society had not funds to publish, its resources having been exhausted by the recent publication of a treatise on fishes.

But time would fail me to speak of Cavendish, of Davy, of Franklin, of Priestly, of Wollaston, of Brewster, of Buckland, of Faraday, of Herschel, and of a host of others who, from its foundation to the present day, have contributed to make famous the Royal Society of London.

So far as the object of its founders was concerned, the Promotion of Natural Knowledge—the encouragement of investigation and research—the Royal Society was nobly fulfilling the hopes that were entertained of it, and the expectations of its friends. But in order that a nation may advance in science it is not enough that it has philosophers, it is necessary that the results of the labours of its philosophers should be communicated to the nation at large, and that the public should be educated up to be able to understand and appreciate them. As yet there was no provision for this. But with the hour came the man. This man was Benjamin Thompson, better known by his title of Count Rumford, a name familiar to everybody, although of the man himself much less is generally remembered than his merits deserve. It may not be familiar to all of us that his title is derived from the New Hampshire village in which he was born in the middle of the last century, a village then called Rumford, but now known as Concord. His youth was that of a typical Yankee boy. He took a keen interest in chemical experiments, and although the Fourth of July had not yet been invented, he blew himself up with fireworks before he was sixteen. He served as clerk in a dry goods store in Boston, taught school, and, at the age of twenty, married a wealthy widow, and became a major of militia. At this juncture the Revolutionary War broke out and Thompson took the King's side. Sent with despatches to England he found favour in influential quarters, received a public appointment, and, returning to his youthful tastes, began a course of scientific investigations, and was elected a Fellow of the Royal Society. He made a friend of Hardy, and all through the campaign of 1799 he was on board the *Victory*, making experiments in gunpowder. We next find him Colonel of the King's American Dragoons, at the head of which he served with courage and distinction, and high in the friendship and confidence of Sir Guy Carlton. On the reduction of his regiment, subsequent to the close of the war, he went to Vienna to serve with the Austrians against the Turks. But thc expected hostilities not taking place he entered the service of the Elector of Bavaria as Colonel of Cavalry and Aide-de-camp General. He devoted himself to physical researches and to the inauguration of reforms of all kinds, economical, political and military. Honours were showered upon him. He became Lieutenant-General of the Bavarian armies, a Count of the Holy Roman Empire, and was decorated with the order of the White Eagle. But, with all his manifold employments, he found time to pursue his scientific investigations, and was made a member of the Academy of Sciences of Berlin and of Bavaria. Returning for a while to England he read before the Royal Society in 1798 his remarkable paper "on the source of the heat which is generated during friction." While superintending the boring of cannon in the arsenal at Munich he was struck by the heat produced, and led to construct a special boring apparatus, by means of which he succeeded in making water boil. The paper is a description of these experiments, and contains the pregnant idea, expressly stated, that heat produced in this way could not possibly be a material substance—could not, indeed, be readily conceived as anything other than motion. Anxious to introduce into England those reforms with reference to the condition of the poor which he had endeavoured to inaugurate abroad, he set on foot, among other schemes, an institution "for the diffusion of scientific knowledge, and for the teaching of the application of science to the useful purposes of life." The outcome of this was the Royal Institution. Rumford was greatly interested in the economical applications of fuel. He had done a great deal in this direction in the kitchens of several public institutions in several parts of Europe; and one of his leading ideas with reference to the new institution was the exhibition of models of fire-places, stoves, boilers, as well as houses, bridges, spinning wheels, and such other machinery as the managers should deem worthy of public notice. In addition to this, a lecture-room was to be fitted for philosophical lectures and experiments, and a laboratory established and furnished with all the. necessary apparatus for chemical and physical investigation. The instituion began its life with the present century, and the chair of Chemistry was soon filled by a young Cornish chemist, Humphry Davy, then only in his twenty-third year. The extent of his attainments, the originality of his ideas, and the fluency of his delivery, combined, perhaps, with his youth and good looks, took the London world by storm. The Royal Institution became the fashion. The gay world crowded to Davy's lectures, and Rumford's boilers and soup-kitchens were elbowed out of the way. The chair of Natural Philosophy was filled by Dr. Young—that extraordinary genius who added to his brilliant mathematical attainments, not only the command of nearly all ancient and modern languages, and a knowledge of botany of no mean order, but also remarkable proficiency in music, and, what is certainly not common among professors of Natural Philosophy—wonderful skill and daring as a circus rider. He was soon succeeded, however, by Dalton, who described his new colleague, Davy, as a "very agreeable and intelligent young man, whose principal defect as a philosopher was that he did not smoke!"

Men like these were sufficient to establish the renown of the Royal Institution; and the names of Faraday and Tyndal, who succeeded them, are enough to show that they found worthy successors.

As an exponent of science the Royal Institution addresses itself almost exclusively to the upper classes. Rumford's projects have been to a large extent carried out by another institution, in whose foundation he had no share—the Society of Arts.

Rumford himself soon returned to Bavaria, where he only remained a short time, and spent the closing years of his life in great retirement in Paris. He seems to have made few friends among the Parisians, partly because of his peremptory and unyielding disposition, and partly because of his eccentricities. Among the latter was his habit of wearing in winter a white coat and hat in order to reduce the radiation of heat from his body to a minimum.

At the time of the foundation of the Royal Society the scope of natural knowledge was so limited that one society was sufficient to include all those who pursued scientific research; and yet, as early as 1664—that is the year after the society received its amended charter—eight committees were struck for the purpose of furthering investigation in different directions. As, however, the number of known facts in each branch of science increased, and the field for further investigation opened out *pari passu*, while the number of special workers was also rapidly multiplied, one society was no longer able to include all the work, and various special societies one after the other began to spring into vigorous life.

The Society of Antiquaries was chartered in 1751.
The Society of Arts was founded in 1753.
The Linnæan Society was founded in 1788.
The Geological Society in 1807.
The Royal Astronomical Society in 1820.
The Zoological Society in 1826.
The Royal Geographical Society in 1830.
The Botannical Society in 1836.
The Microscopical Society in 1839.
The Chemical Society in 1841.
The Philological Society in 1842.
The Ethnological Society in 1843.

Besides these and other societies for the advancement of pure science, there are the various professional association: the Institution of Civil Engineers, the Medical and Law Societies, the Royal Institute of British Architects, and the Pharmaceutical Societies.

This, then, is a brief outline of the development of a few of the more important of the Learned Societies of England, which, together with hosts of others in other parts of the British Empire, in Europe, and in America, have done so much for the Promotion of Natural Knowledge. Let us now briefly consider what are or should be the aims of such associations, what are their proper functions, and how their objects may be best fulfilled.

I think all will agree that the first and most important function of Learned Societies is the publication of the results of investigation. It is before all things necessary to the growth of knowledge that the discoverer of a new truth should have the opportunity afforded him of making his discovery known as widely and as promptly as possible. It is most desirable that those engaged in research should have the fullest possible means of making themselves acquainted with what has been done by others, or, as the phrase goes, with the condition of our present knowledge of the subject. One truth leads to another; and each new fact observed, each new law established, suggests fresh fields for investigation, and furnishes new weapons to the armoury of science. *Vixere fortes ante Agamemnona.* There were philosophers before Newton, but, unless they had sufficient private means to publish their own works, or enough influence to induce some wealthy man to do so for them, oblivion awaited them with far more certainty than any pre-homeric hero. For conquests remain if the conqueror's name is forgotten; but a discovery unpublished is lost to the world. But, all-important as they are, it unfortunately happens that even in times of the greatest intellectual activity, and among the most highly cultivated people, the records of original research, even of the most brilliant character and upon the most momentous subjects, can never command a remunerative market. They must be published at a pecuniary loss. The number of those whose training enables them to follow intelligently the technicalities of such a paper is necessarily limited, and the number of those whose interest in the special subject under consideration is sufficient to induce them to master the tedious details of experiment and induction by which the conclusion is reached is usually still more limited. Moreover, such publications are often very expensive. Carefully executed drawings of apparatus or natural objects, machinery or anatomical details, diagrams and mathematical formulæ, combine to render them in many cases exceedingly costly. And, since the author can seldom hope for any pecuniary advantage from them, while he has usually already expended much valuable time, and often also money in the research itself, without any expectation of profit or reward, it is not only most desirable, but it is an act of bare justice, that the expense of publication should be shared among those interested in the subject of the investigation; and indeed frequently but for channels so offered most valuable investigations would either never see light or would be published in such an inadequate way as to lose half their value.

Herein lies the immense public benefit of the published Transactions of Learned Societies. By means of them any one who does work worth recording has an opportunity of publishing his investigations free of cost; and knows that when he does so his work will be immediately placed in the hands of all those likely to take an interest in it, and capable of appreciating it at its proper value. So, too, the student who wishes to keep abreast with the march of knowledge has only to read the Transactions of the Learned Societies to learn all that is being done in his special line of study.

Another object of scientific associations is to promote intercourse among those pursuing similar lines of research, and indeed among those engaged in the cultivation of science in any of its departments.

This also is a highly important function. The stimulus derived from the impact of mind upon mind, whereby ideas are often generated like sparks from flint, is proverbial. Personal contact, too, with men distinguished in any branch of science has a wonderfully stimulating effect upon the younger students of the same branch; and experience abundantly shows that in science as elsewhere it is not good for man to be alone. The reading of a paper in such a society is usually followed by a discussion in which those whose special studies have rendered them familiar with the subject of which the paper treats join, and, with an audience understanding the subject and capable of fairly criticizing the paper, this discussion is often as valuable as the paper itself.

Again, science is now so vast that it is wholly out of the power of any man to master it all. Hence the division of labour. Hence the separation of Human Knowledge into separate sciences. But after all these divisions are not hard and fast lines. Each science so called is dependent more or less upon its fellows; and each contributes its share to the others. Chemistry cannot do without Physics, and Biology cannot do without Chemistry, while Geology is an application of all three to the study of the earth's crust. There are, therefore, advantages of no mean order in the facilities afforded by learned societies for the intercourse of students of different branches of science with one another.

The social element then, as we may call it, is an important factor in the influence of Learned Societies upon the advancement of science. But science does not exist only for the scientific. It is a most essential condition to its exercising its due influence upon the world that its discoveries should be disseminated among mankind at large. And this propagation of knowledge is another most important function of Learned Societies. We hear much now-a-days of popular science, and the phrase as sometimes understood has a rather questionable signification. Too often those who have undertaken to enlighten the people in scientific matters have been sadly unfitted for their self imposed task. The spectacle of a man with only the merest smattering of a subject endeavouring to teach those whose ignorance is only less than his own is not an edifying one. Unfortunately it is not a rare one. The shallow pretender who seems to think that any knowledge that goes beneath the skin of the subject would only be an incumbrance likely to hinder his glib and self satisfied deliverances has done much to bring science into disrepute. It cannot be too strongly urged that no man can teach what he does not know. Self evident as the proposition seems, experience constantly shews that it is in danger of being ignored.

With some again popular science is another name for scientific fooling. They seem to think that the popular stomach is unable to digest anything but froth. "Strong meat is for men and milk for babes," but these people feed their scientific infants not on good wholesome milk, but on sugar plums and curry powder. Their children cry for bread and they give them a Pharoah's Serpent!

None the less, however, is it a matter of the highest moment that sound scientific instruction should be given to the public, that the truths laid hold of by the few should be made known to the many, that science should be no esoteric possession of the favoured few, but should become the heritage of the world.

The vastness of the practical benefits which the application of scientific discoveries and scientific principles to practical life has brought in the past, and is likely to bring in the future, is one most cogent reason for the more general dissemination of these discoveries and principles.

If we try to picture to ourselves the condition of society at the end of the 17th century, when Savery exhibited before the Royal Society a model of his engine for Raising Water by Fire, and compare it with that with which we are now familiar, when the great agents of Heat, Light and Electricity have been brought by the aid of science into such wonderful subjection to the wants of mankind; and if we try to pierce with prophetic vision into the mists of the future, and speculate upon the gigantic possibilities which the light of science, brightening every hour, seems to render visible before us, we may well be impressed with the necessity of disseminating a knowledge of science as a means of benefiting the human race.

But besides the practical advantage to be derived from the spread of scientific information, it has a highly important reflex action upon the scientific investigator.

Man will not work without a motive, and the applause of a discriminating public is one very strong incentive to exertion in science as in every other field of labour. It is true that some men love knowledge for its own sake, and that the most successful workers are likely to be those who are enamoured of their labour. But for all that, there can be no doubt that a sympathetic appreciation of his work is a most grateful and effectual stimulus to the scientific investigator, and in most cases beyond the pleasure that his labour itself brings, it is the only reward he can have or hope for.

Now the amount of sympathy and appreciation that a scientific investigator gets is in direct proportion to the number of his fellow men who are capable of understanding his work, and whose tastes are cultivated sufficiently to awaken in them an intelligent interest in it. Here, then, we have another cogent argument in favour of the importance of the diffusion of scientific knowledge among the people.

Then scientific investigation costs money. It demands, in the first place, leisure on the part of the investigator. Then the apparatus required in exact researches is frequently most expensive, and is every day becoming more so. The time has gone by when discoveries which revolutionize science can be made with a few glass bottles and a pair of apothecary's scales. To do good work instruments of the greatest refinement and delicacy are absolutely necessary, and such instruments are not to be had for nothing. In many cases the apparatus used for a particular research is of no further use when that research is completed, and becomes of merely historic value. Then there is publication, the cost of which we have already considered. Again, a philosopher is not born but made. True, nature must do her part, but what would avail the genius of a Newton or of a Lavoisier if—

> "—— Knowledge to their eyes her ample page,
> Rich with the spoils of time, did ne'er unrol,
> Chill penury repressed their noble rage,
> And froze the genial current of their soul."

The man who is to accomplish anything in science must have a scientific training, and a scientific training means laboratories, lecture rooms, apparatus, books and instructors, and here again the question of cost stares us in the face.

Now, science is never self-supporting. The application of science to the arts is often extremely profitable. The cultivation of pure science is never so; yet upon this cultivation of pure science all the applications of science directly depend. It is then adsolutely necessary to the advancement of science that scientific institutions of various kinds should be supported by generous donations either from the public funds or from private munificence. Without liberality in this respect there can be no scientific progress.

Now it is obvious that private contributions to scientific objects can only be looked for in a community among which a knowledge of the importance of science and of the needs of science is prevalent. So, also, no considerable grants of public money for scientific purposes can be expected unless those who control the public purse are impressed with the importance of science from a national point of view. In a free country the public purse is controlled by the people themselves, and it is self-evident that the most likely way to impress them with the importance of science is to disseminate among them a knowledge of its facts and principles. A sound and liberal popular scientific education is indeed the only way to ensure an enlightened public support of scientific institutions and a proper public recognition of the claims of scientific investigators.

A great scientific discoverer is an expensive product. As thousands of eggs are laid for every trout that arrives at maturity, so it takes a thousand embryo philosophers to produce one Newton. It is well, then, that public attention should be directed to science in order to incite promising youths to acquire a scientific training, and thus qualify themselves to follow scientific pursuits.

These then, I take it, are the objects and functions of a scientific association :—

1. To publish transactions ;
2. To afford opportunity for intercourse among scientific men, and
3. To assist in the diffusion of scientific knowledge among the people at large.

How may they best be accomplished ?

With regard to the first I have nothing to say. The form of the transactions must be left to the exigencies of each individual case.

As for the third head, viz., the diffusion of scientific knowledge, there are two ways in which it seems to me that a scientific society can promote this object : —

First, the very existence of an active society of this kind in a community is a kind of scientific mission continually winning converts to the cause of scientific study, and inciting them by precept and example to keep themselves abreast with advancement of knowledge. By reading papers and by discussion scientific culture is promoted among the members, and by a library and reading room an opportunity is given them to acquaint themselves with what has been done and what is doing in all departments of science.

Secondly, an important method of attaining this object is by means of public lectures upon scientific subjects delivered by competent persons.

These lectures should be suited to a popular audience, in so far that they should assume no profound knowledge of the subject on the part of the audience, and hence should avoid unexplained technicalities. But they should not be "popular" in the sense alluded to previously of conforming to the (generally erroneously) supposed popular taste for the sensational and the trifling to the exclusion of the useful and the solid.

A popular scientific lecture, which is really popular and really scientific, is an excellent thing, and well deserving the encouragement of a Learned Society.

Intercourse among the members is promoted formally by papers and discussions, and informally by affording a common meeting place and common interest for those engaged in scientific pursuits.

Much of the value of a society from this point of view will depend upon the interest shewn at its meetings and the character of the papers read. And here a society of general scope, such as our own, is placed at a marked disadvantage as compared with one which addresses itself to the cultivation of a special branch of science.

The reader of a paper before a mixed audience, such as the members of such a society, is placed between the horns of a dilemma. He must either adapt his discourse to the audience generally, and thereby make himself tedious to those whom he particularly wishes to interest, while he will be compelled to omit much of what would be of special value to those who understand the subject of his paper. Or he must address himself to those who have made his department of science their peculiar study, and thereby render himself unintelligible to nine-tenths of his audience.

There are a hundred little points of detail which are of the keenest interest to those actually working in any branch of science but which are not the slightest consequence to anyone else. The discussion of such points as these gives life and interest to a meeting of specialists, which can not be attained elsewhere. From these and similar considerations, as well as from the mere demands of time and space, the various special societies have in England come to monopolize the greater part of the work which the Royal Society originally undertook, while that body reserves to itself the consideration of questions involving the general principles of science and leaves matters of detail to the special societies for the cultivation of the different branches of science. Yet, in the Royal Society itself, the principle of division of labour is by no means neglected. As early as 1664 eight committees were formed for the purpose of promoting the propagation of natural knowledge in different directions. With some few modifications these committees still exist and form part of the machinery of the Society. These committees comprise :—

Mathematics, Astronomy, Physics and Meteorology, Chemistry, Mineralogy and Geology, Botany and Zoology.

Each of these committees has its own chairman and secretary. The Royal Society of Canada, a body fashioned to some extent on the lines of the Royal Society of London, although in other respects it rather follows the model of the French Academy, is divided into sections with special officers, each charged with the care of certain allied subjects. The British Association is similarly divided into sections as follows :—

A.—Mathematical and Physical Science.
B.—Chemical Science.
C.—Geology.
D.—Biology.
E.—Geography.
F.—Economic Science.
G.—Mechanical Science.

The American Association has a similar division as follows :—

A.—Mathematics and Astronomy.
B.—Physics.
C.—Chemistry.
D.—Mechanical Science.
E.—Geology and Geography.
F.—Biology.
G.—Histology and Microscopy.
H.—Anthropology.
I. —Economic Science and Statistics.

Now, it seems to me that some such divisions might with great advantage be introduced into the Canadian Institute, and I would venture to suggest for your consideration the outlines of such a scheme. If the idea should be favourably received details can be considered at leisure, and the plan modified as seems best.

Briefly, then, I would suggest the establishment of say four sections as follows:—

A.—Mathematics, Physics and Mechanics.
B.—Chemistry, Mineralogy and Geology.
C.—Biology.
E.—Ethnology, Philology, History and Economy.

Each of these sections should have its own chairman and secretary, who, with the officers of the Institute, might constitute the general council.

Each section might meet once a month, and whenever there was a paper of sufficiently general interest to merit its being read before the whole body of members, a general meeting of the Institute might be held.

I am fully aware that the division that I have suggested is far from a philosophical one, and I am in no way wedded to any of the details of the scheme. All I ask is that the members of the Institute will give the matter their consideration, and if it seems to them that the change will be likely to have the effect of arousing more interest in the meetings of the Canadian Institute and of furthering the objects that we all have at heart, then I shall be happy to adopt any modification that the Institute think best, and I will gladly co-operate in giving such a scheme a fair trial.

FOURTH ORDINARY MEETING.

The Fourth Ordinary Meeting of the Session 1884-'85, was held on Saturday, November 22nd, the President in the Chair.

The minutes of last meeting were read and confirmed.

Donations and Exchanges received since last meeting:

1. The Canadian Entomologist, Vol. XVI., No. 8, August, 1884.
2. Monthly Weather Review, October, 1884.
3. Monthly Health Bulletin of Ontario, September, 1884.
4. Science, Vol. IV., No. 93, November 14th, 1884.
5. Transactions of the American Society of Civil Engineers for September, 1884.
6. Memoirs of the Boston Society of Natural History, Vol. III., No. 10 May, 1884.

7. Monthly Notices of the Royal Astronomical Society, Vol. XLIV., No. 9.
8. Proceedings of the Royal Geographical Society, N.S., Vol. VI., No. 11, November, 1884.

The following gentlemen were elected members of the Institute:

W. S. Milner, B.A., Dr. T. Walker Simpson, William McCabe, Esq., Geo. H. Jarvis, Esq., Robert Winton, Esq.

Mr. W. A. Douglas then read a paper on

WAGES.

The current doctrines respecting the distribution of wealth are very contradictory, and still require much investigation. Mill's doctrine of wages has three assumptions:

1. Wages are drawn from capital, that part thus devoted being called the wage-fund.

2. Average wages may be ascertained by dividing the wage-fund by the number of labourers.

3. Wages can be increased only by increasing the numerator or diminishing the denominator.

Therefore, if wage-fund be 10, labourers 5, wages will be $\frac{10}{5} = 2$, and if labourers be increased to 6, wages will full to $\frac{10}{6} = 1\frac{2}{3}$.

The following are a few of the objections of this doctrine:

1. An additional labourer will receive employment only on condition that he produce 2 + something, that something being enough to cover profit and rent. The additional labourer will increase not merely the denominator but also the numerator.

2. It is illogical, Mill teaches that capital is one of the component forces, wealth the resultant; wages, rent and profits, the division of the resultant. He is, therefore, illogical in calling capital a component force and also a resultant.

3. This doctrine teaches a wrong perspective of society. It represents the capitalist as the initial party in production, supporting the labourer, and the latter as the dependent party; whereas, in fact, the capitalist and labourer are co-workers, mutually dependent, working concurrently to obtain wealth, and when the wealth is produced, then dividing the product.

The study of political economy presents two distinct questions:

1. Given a number of labourers and a certain quantum of natural forces; what will be the product?

2. Given a certain product, what quantity will go to the landowner, the capitalist, and the labourer? This is the question to be solved that we may determine wages.

Ultimate analysis will show that the division of the product is either for land or for labour.

To determine the distribution of the product we must have regard to the following considerations:

1. Competition of labourers amongst themselves. Labourers are moveable, hence within areas in which competition is effective, wages are equal among labourers of the same class.

2. Competition of landowners amongst themselves. Land is inmovable, hence the values differ enormously, all the way from nothing in rural districts to fifty or one hundred thousand dollars per acre per annum in cities.

3. Competition of labourers against landowners. Labourers increase, land does not. Increase of labourers increases their competition, rents rise at the expense of wages.

4. Relative power of landower and labourer in determining a bargain. Labourers must have access to land or die; this dependence is absolute. The dependence of the landowner is determined only by the necessity of maintaining the labourer alive. Hence unskilled labour has ever had to be content to accept a bare subsistence. The fulcrum is placed so that the advantage is altogether with the landowner. Strikes, as at present conducted, do nothing to remove that fulcrum in favour of the labourer.

Mr. Murray criticized the principles advanced by Mr. Douglas, contending that rent had not increased but diminished; that wages had not diminished this century, and that the rich are not becoming richer and the poor poorer. He declared that wages must be a matter of free agreement between employer and employé.

Dr. Bryce questioned the statement that the amount of wages earned, when land produces no rent, is the measure of the wage-fund.

Mr. Browning controverted the position that wages diminish as wealth and population increase, and that the statistics show the contrary.

Mr. Livingston said labour and capital regulated themselves.

Mr. Douglas made a general reply.

FIFTH ORDINARY MEETING.

The Fifth Ordinary Meeting of the Session 1884-'85, was held on Saturday, November 29th, the President in the Chair.

The minutes of last meeting were read and confirmed.

Donations and Exchanges received since last meeting:

1. List of Publications of the Geological and Natural History Survey of Canada, 1884.
2. Science, Vol. IV., Nos. 94 and 95.
3. Transactions of the American Society of Civil Engineers for October, 1884.
4. The Journal of Speculative Philosophy, Vol. XVIII., No. 1, January, 1884.
5. Bulletin of the Museum of Comparative Zoölogy at Harvard College, Cambridge, Geological Series, Vol. I., Nos. 2, 3, 4, 5, 6, 7, 8 and 11, with Title page and Index to the Vol.
6. Bulletin of the Essex Institute:
   - Vol. 15, Nos. 7, 8, 9, July to September, 1883.
   - Vol. 16, Nos. 4, 5, 6, April to June, 1884.
7. Report of the Proceedings of the Sixteenth Annual Convention of the American Railway Master Mechanics' Association, held at Chicago, June 19th, 20th and 21st, 1883.
8. Transactions of the Manchester Geological Society, Vol. XVIII., Part I., Session 1883-'84.
9. Journal of the Quekett Microscopical Club, Series II., Vol. II., No. 10 November, 1884.
10. Journal of the Anthropological Institute of Great Britain and Ireland, Vol. XIV., No. 2, November, 1884.
11. Trübner's American, European and Oriental Literary Record, N.S., Vol. V., Nos. 9 and 10.
12. Minutes of Proceedings of the Institution of Civil Engineers, Vol. LXXVIII., Session 1883-1884. Part IV. Brief Subject-Index to Minutes of Institutions of Civil Engineers, Vols. LIX. to LXXVIII.
13. Correspondenz-Blatt der Deutschen Gesellschaft für Anthropologie, Ethnologie, und Urgeschichte, XV. Jahrgang, No. 9, September 1st, 1884.
14. Canadian Practitioner, December, 1884.

Mr. Thomas Robertson was elected a member of the Institute.

Captain Gamble Geddes, A.D.C., read a paper on

THE AFFECTION OF INSECTS FOR THEIR YOUNG.

The writer of this paper took the ground "that insects are capable of feeling quite as much attachment to their offspring as the largest quadrupeds. They undergo severe privations in nourishing them; they expose themselves to great risks in defending them, and even at the time of death much anxiety is exhibited for their preservation." This was not claimed for all insects, but in proof of the writer's contention the instances adduced were those of the common house-fly, the common white butterfly, the musquito, the gadfly, ichneumon flies, the ephemeridæ, the clothes-moth, the wild bee and the beetle.

Reference was made to the various expedients and artifices employed by these in suitable places upon which to deposit their eggs, with a view not only to the safety of the eggs themselves, but to the sufficiency of a food supply when the young reaches its perfect state.

In concluding his paper, the writer said:—"I have myself, upon many occasions, experimented with the dead bodies of frogs, and even with fish—all those are excellent baits to attract the species of our own Canadian burying insects—and I have enriched my collection with fine specimens many a time, after observing their habits sufficiently to be convinced that it is for the object of a future supply of food for the larva that the beetles undergo this severe labour," *i. e.*, the dragging and burying of the bodies of small animals.

Remarks were made by the President, Drs. Workman and O'Reilly, and Messrs. Macdougall, Murray, Notman, Livingston, VanderSmissen and Mowat.

SIXTH ORDINARY MEETING.

The Sixth Ordinary Meeting of the Session 1884-'85, was held on December 6th, 1884, the President in the Chair.

The minutes of last meeting were read and confirmed.

Donations and Exchanges received since last meeting:

1. The Canadian Entomologist, Vol. XVI., No. 9, for September, 1884.
2. Journal of the Franklin Institute for December, 1884.

3. Proceedings of the Asiatic Society of Bengal, Nos. 6 and 7, June and July, 1884.

   Journal of the Asiatic Society of Bengal, Vol. LIII., Part II., No. 2, 1884.
4. Mittheilungen der Anthropologische Gesellschaft in Wien, XIV. Band, 2 und 3 Heft.
5. Archivio per l'Antropologia e la Etnologia, Vol. XIV., Fascicolo Secondo Firenze, 1884.
6. Société des Ingénieur Civils, Séance du 7th November, 1884.

Mr. F. J. Garden and Mr. Herbert L. Bowman were elected members of the Institute.

Dr. Daniel Wilson read a paper on "The Bohemian Skull," which will appear in a subsequent fasciculus.

Messrs. Buchan and Bain made brief remarks.

A paper by Dr. Neil MacNish on "The Gaelic Topography of Damnonia," was read for the author by Mr. VanderSmissen.

THE GAELIC TOPOGRAPHY OF DAMNONIA.

I propose in this paper to examine the Topography of that portion of England which was at one time known as Dumnonia or Damnonia. For the sake of convenience it may be maintained that Damnonia embraced Devonshire, Cornwall, and the Scilly Isles. A writer in the *Encyclopædia Britannica* remarks that "Dumnonia or Damnonia, the Latinized name of a kingdom which long remained independent after the arrival and early conquests of the West Saxons, seems to be identical with the Cymric Dyfnaint, which survives in the present Devon. The Saxon settlers, as they advanced into the country, called themselves *Defenas, i. e.*, men of Devon or *Dyfnaint*, thus adopting the British name." Into *Dyfnaint, Devon*, the Welsh word *dwfn*, Gaelic *domhain*, seems to enter as a component part. Professor Rhys states, that the remains of the language of the Dumnonii in Devon and Cornwall leave no kind of doubt that they were of the earlier Celts or Goidels, and not Brythons. I am of opinion that satisfactory evidence can still be extracted from the names of rivers and bays and headlands in the ancient kingdom of Damnonia, to show that Celts, whose language was Gaelic, gave in the distant past many of those topographical appellations which, with various degrees of correctness, have come down to our own time. It may be safely affirmed that the names which were given in an early age to the streams and lochs and hills and headlands of a country were intended to express some physical peculiarity. In his introduction to the "Vindication of Irish History" (p. 6), Vallancey thus writes: "It is unreasonable to suppose that the proper names of men, places, rivers, &c., were originally imposed in an arbitrary manner, without regard to properties, circumstances, or particular occurrences. We should rather think that in the earliest period, and especially when the use of letters was unknown, a name usually conveyed a brief history of the thing signified; and thus recorded as it were by a method of artificial memory." Dr. Bannister, the author of a Glossary of Cornish names, says "that Cornwall is a peculiar country. From its geographical position it may be called the first and last in England; and *one and all* good Cornishmen will maintain that it is also the best. Time was when Devonshire was part of Cornwall, with Exeter, it is thought, for its capital; which city was till the tenth century inhabited conjointly by Cornish and Saxons. The Cornish were driven across the Tamar by Athelstane; and it was declared death for one to be found east of its banks." It was about 930 that Athelstane thus violently compelled the Cornish to retire to the west of the Tamar. Devonshire, therefore, was much more strongly subjected to Saxon influences than Cornwall; and hence it may be expected, that the traces of Gaelic will be less distinctly and commonly marked in the Topography of the former than of the latter county.

The names of the rivers of Devonshire readily disclose their Gaelic origin, *e. g.*:

Teign, *teth*, hot, and *an*, *amhainn*, river. The *Tyne* of Haddington and Northumberland.

Dart, *doirt*, to rush, or pour out.

Plym, *plum*, to plunge.

The *Mew* and *Cad* unite to form the *Plym*.

Mew or *Meavy*: *magh*, a plain; or *meadhon*, middle.

Cad, *cath*, battle; or *cas*, rapid.

Tavy, *Taw*, *tamh*, quiet, *a* river. The Thames, Tay in Scotland, and Taff, Tave, Taw in Wales, come from the same root. *Tabh* in Irish and Scottish Gaelic signifies *water* or *ocean*.

Torridge, *Tor*, *Tory*: Into those names *torr*, a heap or round hill, clearly enters. *Torr* is a purely Gaelic word. It forms one of the expressive monosyllables which frequently occur in the poems of

Ossian. It is present in such words as Tormore, Torness, Torryburn, Torryline, Tory Island.

Avon, *amhainn*, a river.

Erme, *ear*, east; *amhainn*, a river.

Yealm, *ealamh*, quick.

Exe, *uisge*, water.

Culme, *cul*, back; *magh*, a plain. *Cul* occurs often in the Topography of Scotland, *e. g.*, Cullen, Culross, Culloden.

Creedy, *criadh*, clay.

Otter, *oitir*, a ridge near the sea, *Dunottar*.

Axe, *uisge*, water.

East Lyn, *West Lyn*, *linne*, a pool. *Linne* is present in such words as Dublin, Roslin, &c.

Barle, *barr*, a top; *liath*, grey.

Oare, *odhar*, dark-grey, sallow.

Mole, *moyle*, *maol*, bare.

Oke, *oiche*, *uisge*, water.

Yeo, Welsh *aw*, flowing, Gaelic, *a* water, resembles very strongly *Awe* in Argyllshire.

Bray, *Braighe*: height or upper part.

The names which have now been adduced are Gaelic, and occur frequently in the Topography of Ireland and Scotland, thereby enabling us to conclude that the same people who employed such words as *Teign*, *Avon*, *Tay*, *Awe*, &c., in connection with the streams and rivers of Ireland and Scotland, made use of the same words in connection with the streams and rivers of Devonshire.

Cum, valley or dingle; Cornish, *cwn*; Welsh, *coom*, *Coome*, *Coombe*; Irish, *cumar* or *Comar*, a confluence of waters, occurs repeatedly in the Topography of Devonshire, *e..g.*:

Lannacombe, *lan*, full.

Colcombe: *caol*, narrow.

Branscombe, *bran*, a mountain stream.

Dunscombe, *dun*, hillock.

Wiscombe, *wis*, *usk*, *ouse*, water.

Salcombe, *sal*, the sea or salt water.

Orcombe, *oir*, border.

Purely Gaelic words are thus found in combination with *cum*, a term which is found with little variety in Irish and Scottish Gaelic, and Welsh and Cornish.

So unmistakable is the Gaelic complexion of *Torr*, and so commonly is it to be found in the Topography of Ireland and Scotland, that were other evidences altogether wanting, the constant occurrence of it in the names of places in and around *Dartmoor* and elsewhere in Devonshire, might furnish a strong argument in favour of the contention, that Celts who spoke Gaelic must have occupied that part of England for some time at least during the early settlement of Britain. Were it to be maintained that *Dart* in *Dartmoor* is the Gaelic word *tart, thirst* or *drought*, a striking correspondence would be found between the very name and the sterile character of that region. *Moor*, the latter syllable of *Dartmoor*, bears a close resemblance to *mòr*, the Gaelic adjective for *great* or *extensive*. Thus interpreted, *Dartmoor* would signify *the extensive drought*. Nor can there be any difficulty in seeing how Dart, the principal river which issues from Dartmoor, and to which I have already assigned the derivation *doirt*, would bear the name of the region in which it rises, in spite of the incongruity that may attach to applying to any river of considerable magnitude a name that is indicative of drought or scantiness of water.

Crockern Torr is the name of a hill in the centre of Dartmoor, where the legislative business of the tin mines of Devonshire used to be transacted. *Crockern Torr*, *cnoc air an Torr*, the hill on the heap. The name is purely Gaelic, and the well-known word *cnoc* occurs in it.

In *Torquay*, *Torcross*, the word *torr* is present. Other names of places in Devonshire are of Gaelic origin, *e.g.:*

Carnmere, carn, a heap or pile of stones. *Kenton, ceann*, head; *dun*, a hillock. *Hamoaze, camus, chamus*, a harbour; *Culbone, cul*, back; *beinn*, a hill.

Beer, bior, water.

Ness, an eas, cascade.

Exbourne: uisge, water: *burn*, water. In such words as *Cudleigh, Leigh, Chumleigh—, liath*, grey or hoary appears.

The Topography of Devon, in spite of all the political changes that have passed over that county, and in spite of the different races that have inhabited it, preserves unmistakable reminiscences of Gaelic-speaking Celts, who must have been its earliest inhabitants of any permanence.

Isaac Taylor, in his "Words and Places," affirms that the word *Cornwall* or *Cornwales* signifies *the country of the Welsh, or strangers of the horn*. *Cornwall* may be regarded as a compound of *corn*, a Cornish word signifying *horn*, and *waller* a *stranger*. The origin of the term *corn* or *horn* may be discovered in the peculiar form of Cornwall, running as it does like a horn into the sea. *Cernow* is the Cornish word for Cornwall, and *Cernewec* and *Kernnak* for Cornish, *e. g.*, *Metten da dha why: elo why clapier Kernnak:* good morning to you, can you speak Cornish? Max Müller, who has evidently bestowed great attention on the language and antiquities of Cornwall, thus writes in his "Chips from a German Workshop" (Vol. 3, pp. 242, 247): "The Cornish language is no doubt extinct, if by extinct we mean that it is no longer spoken by the people. But in the names of towns, castles, rivers, mountains, fields, manors and families, Cornish lives on and probably will live on for many years to come. More than four hundred years of Roman occupation, more than six hundred years of Saxon and Danish sway, a Norman conquest, a Saxon reformation, and civil wars, have all passed over the land, but like a tree that may bend before a storm but is not to be rooted up; the language of the Celts of Cornwall has lived on in an unbroken continuity for at least two thousand years." Norris, the editor of the ancient *Cornish Drama*, is of opinion that the Cymric was separated from the Gaelic before the division into Cornish and Welsh was effected, and that Cornish is the representative of a language once current all over South Britain at least. The author of the article on "Celtic Literature" in the *Encyclopædia Britannica* writes that "among the British dialects, the most archaic, *i. e.*, the one which best represents the British branch, is Cornish; which is the descendant of the speech of the unromanized Britons of England."

So very numerous are the Celtic words in the Topography of Cornwall, that, in his Glossary of Cornish names, Dr. Bannister asserts that there are 20,000 Celtic and other names. Owing to the difficulty as well as the uncertainty which must of necessity obtain in arriving at the true derivation of so many words, Bannister has with commendable modesty adopted as his motto the expressive language of Horace:—

> "Si quid rectius istis
> Candidus imperti: si non his utere mecum."

The names of the streams and rivers of Cornwall are to a large extent Gaelic, *e. g.* :—

Tamar,	*tabh*, water; *mor*, large.
Camel,	*cam*, crooked; *heyl*, *tuil*, flood.
Alan,	*geal*, white; *an*, river, *Gealan*. There is a river of the same name, *Allan*, in three counties in Scotland.
Lynher,	*linne*, pool; *hir sior*, long.
Looe,	*loch*, or *luath*, swift.
Fal,	*foil*, gentle; *fal*, a circle.
Bude,	*buidhe* (?), yellow.
Inny,	*innis*, an island; or *inne*, a bowel.
Cober,	*cobhar*, froth.
Kensey,	*ceannsa*, mild, gentle.
Hayle,	*sàl*, *shail*, salt water.
Hone,	*amhainn*, rivers.

It is quite evident that into the names which have been now adduced purely Gaelic roots enter—roots which appear very often in the Topography of Ireland and Scotland. The slight examination that I have made of the names of the rivers of Damnonia will tend to exemplify the correctness of the remarks which Lhuyd makes in the Welsh preface to his *Archæologia Britannica*: "There is no name anciently more common on rivers than *Uysk*, which the Romans wrote *Isca* and *Osca*, and yet, as I have elsewhere observed, retained in English in the several names of *Ask*, *Esk*, *Usk*, and *Ex*, *Axe*, *Ox*, &c. Now, although there be a considerable river of that name in Wales and another in Devon, yet the signification of the word is not understood either in our language or in Cornish; neither is it less vain to look for it in the British of Wales, Cornwall, or Armoric Britain than it would be to search for *Avon*, which is a name of some of the rivers of England, in English. The signification of the word in *Guydeleg* (*i. e.*, Gaelic) is water. * * * So do the words *uisge*, *Loch*, *Ban*, *Drum*, &c., make it manifest that the *Guydhelod* (*i. e.*, the Gaels) formerly fixed their abode in those places."

Carn, which is eminently a Gaelic word, occurs often in the Topography of Cornwall. *Carn* is one of the most expressive monosyllables that are to be found in the poems of Ossian. As *Cairn* it is commonly used in the English language. *Co nach cuireadh clach 'n a charn*, is a Gaelic proverb of very ancient date.

In Cornwall such words exist as :

Carn brea, *briadha*, beautiful.

Carn beak, *beag*, small.

Carn-clog, *clach*, *cloiche*, a stone.

Carn Pendower, *pen ceann* head, *dobhar*, water.

Carn voel, *mhaol*, *maol*, bare.

Carn leskez, *leus*, *loisgidh*, burning.

Carnglos, *glas*, grey.

Carn meal, *mil*, *meala*, honey.

Carn Tork, *torc*, a boar.

Carn Enys, *Innis*, an island.

Cnoc is found in such words as :

Crocadon, *cnoc*, *dun*, a hillock.

Crockard, *cnoc ard*, high.

Carraig, which, along with *carn* and *cnoc* and *dun*, may fairly claim to be regarded as a representative Gaelic word, and which constantly occurs in the Topography of Scotland and Ireland, is present in such names as these :

Carrick gloose, *carraig glas*, grey.

Carradon, *dun*, a hillock.

Caregroyne, *ron*, a seal.

Cardew, *dubh*, black.

Careg Tol, *toll*, a hole.

Cardrew, *doire*, a thicket ; *Druidh*, a *Druid*.

Dun, a hillock or fortress ; Cornish, *Din*, occur in such words as :

Dunbar, *barr*, a top.

Dunsley, *sliabh*, a mountain.

Dunster, *tir*, land.

Dunmear, *mear*, joyful ; *mor*, large.

Tintagel, *Tin*, *dun*, castle ; *diogel* (Cornish), secure. The first syllable is very similar to *dun* or *din*.

Tiadhan is a Gaelic word that signifies a *little hill* ; *dioghailt* in Gaelic signifies revenge. Gaelic roots are thus discernible in *Tintagel*, which is supposed to have been the birth-place and principal residence of the famous Arthur. Borlase says regarding it "that it was a product of the rudest times before the Cornish Britons had learned from the Romans anything of the art of war." So doleful are the changes which time has effected in the palace of Arthur, that is is no longer like the residence of

"that Arthur who
Shot through the lists at Camlet, and charged
Before the eyes of ladies and of Kings.
The old order changeth, yielding place to new."

It appears that there is an old couplet in Carew's Survey

"By *Tre*, *Pol* and *Pen*,
You shall know the Cornish men."

The well-known Cornish rhyme is merely an expansion of that couplet:

"And shall Trelawney die?
Here's twenty thousand Cornish boys
Will know the reason why?
And shall they scorn *Tre*, *Pol* and *Pen*,
And shall Trelawney die?
Here's twenty thousand Cornish men
Will know the reason why."

Camden has the couplet:

"By *Tre, Ros, Pol, Lan, Caer, and Pen,*
You may know the most Cornishmen."

According to him those words mean respectively a *town*, a *heath*, a *pool*, a *church*, a *castle*, or *city*, and a *foreland* or *promontory*.

Tre, *trev*, a home or dwelling place; Irish *treabh*, Gaelic *treubh*, a tribe or family. The word in question does not enter to any extent at least into the Topography of Scotland and Ireland; though it enters very largely into the Topography of Cornwall, *e. g.*:

Trebean, *beagan*, a small number.
Tredhu, *dubh*, black.
Tredryne, *droigheann*, thorn.
Treglome, *lom*, bare.
Trekavwr, *gobhar*, a goat.
Trelase, *glas*, grey.
Tremeal, *mil*, *meala*, honey.

Ros (Cornish, a *heath*, *mountain*, Gaelic, a *promontory*), occurs in Scotland in such names as *Rosdu*, *Roseneath*, *Roslin*, *Ross*, *Kinross*; and in Ireland in such names as *Ross*, *Rosscor*, *Rossmore*. It enters into such Cornish words as

Roscarnon, *carn*, a heap or mound.
Roskear, *ciar*, dusky.

Roskearn, *fearna*, *fhearna*, an alder tree.

Roster, *tir*, land.

Rosevean, *bhan*, *ban*, white; *beagan*, a little.

Pol, a pool, mud, occurs in *Poolvash* in the Isle of Man; and such Irish names as *Poolboy*, *Ballinfoyle*, *Pollrany*; and in such Scottish names as *Polmont*, *Polldhu*, *Poltarff*.

The presence of *Pol* can readily be observed in such Cornish words as these:

Polbrock, *broc*, a badger.

Polcairn, *carn*, a heap.

Poldew, *dubh*, black.

Poldower, *dobhair*, water.

Poldrissick, *dreasach*, thorny.

Polhern, *iarunn*, iron.

Polkillick, *coilleach*, a rooster.

Pollick, *leac*, a flat-stone.

Pollyne, *linne*, a pool.

Polmellin, *muileann*, a mill.

Lan. In his Cornish Dictionary, Williams remarks regarding *Lan* "that its primary meaning was a piece of ground enclosed for any purpose—an area to deposit anything in—a house, a yard, a churchyard." In dealing with the Topography of Wales in a previous paper, I endeavoured to prove on the authority of Dr. Joyce, that *lan* or *lann* is a Gaelic word, and that it does not belong exclusively to the Cymry. Lan is often met in the topographical names of Cornwall, *e. g.*:

Lanarth, *ard*, high.

Lanaton, *dun*, a hillock.

Lancarf, *garbh*, rough.

Landare, *darach*, oak; or *doire*, a thicket.

Landenner, *dun*, a hillock; *hir sior*, long.

Landew, *dubh*, black.

Caer, Gaelic *Cathair*, a city or fortified place, which is of frequent occurrence in the Topography of Ireland and Scotland, and to which a very remote origin must be assigned, appears in such Cornish names as:—

Caer Laddon, *leathan*, broad.

Carbean, *ban*, white; or *beagan*, a little.

Carcarick, *carraig*, a rock.

Cardew, *dubh*, black.

Carhallack, *shalach*, *salach*, filthy.

Carhart, *ard*, high.

Pen, *ceann*, a head, than which no root is more largely present in the Topography of Ireland and Scotland, enters into very many Cornish names, *e. g.* :—

Pelynt, *linne*, a pool.

Penavarra, *bharr*, *barr*, top; or *muir*, *mara*, the sea.

Pencair, *caer*, *cathair*, a city.

Pencarra, *carraig*, a rock.

Pendennis, *dinas* (C.), *dun*.

Pendew, *dubh*, black.

Pendour, *dobhar*, water.

Pendrathen, *traigh*, a shore.

Pendrean, *droighionn*, thorn.

Pendalow, *da*, two, *loch*.

Penellick, *seileach*, willow.

Peninnis, *innis*, an island.

Pennard, *ard*, high.

Penrose, *ròs*, a headland.

Penryn, *rhyn*, *roinn*, a point.

Pentire, *tir*, land; the *Kintyre* of Argyllshire.

Pentell, *toll*, a hole.

It is evident that those distinctive roots or words by which, according to Camden, Cornishmen are to be recognized, are, with the exception of *Tre*, of frequent occurrence in the Topography of Ireland and Scotland, and cannot on that account be restricted to the Cymry, but must be regarded as Gaelic in themselves, and therefore as entering into the Topography of these countries and islands where the Gaels had permanent homes. The citations which have been made from the Topography of Cornwall, in connection with the words or roots in question, show that purely Gaelic nouns and adjectives combine with those roots to form Cornish names.

The Gaelic word *tigh*, a house, enters in the form *chy* into the Topography of Cornwall, *e. g.* :—

Chytane, *tigh an teine*, the house of fire.

Chelean, *tigh an leana*, the house of the meadow.

Chenton, *tigh an duin*, the house of the hillock.

Chycarne, *tigh a' chuirn*, the house of the cairn.

Chryose, tigh an rois, the house of the foreland.

Coille, the Gaelic term for *wood,* which enters into such Scottish names as *Killiecrankie, Killiemore,* is discernible in such Cornish words as :—

Killiard, coille ard, high.

Killignock, coille cnoc, a hill.

Killigrew, coille garbh, rough.

Killivor, coille, mhor, mor, large.

Lios, a garden or entrenchment, which forms the first syllable of *Lismore* in Scotland and *Lisdoo, Lismoyle, Lismullin,* in Ireland, appear in the Cornish names :

Liskeard, lios gu h-ard.

Lizard, the Cornish Chersonesus, *lios, ard,* high.

Toll, a hole, belongs to the category of expressive Gaelic monosyllables, and is found in such Cornish words as :

Tolcairn, toll cairn.

Toldower, dobhar, water.

Tolver, mor, large.

Tolverne, bhuirn, burn, water.

Porth, port, a harbour, is a Gaelic word of indisputable antiquity, and is present in numerous Cornish names, *e. g.:*

Porth ennis, innis, an island.

Porth glas, glas, grey.

Porth lea, liath, hoary.

Porth loe, loch, a loch.

Portugal, port nan Gaidheal, the harbour of the Gaels, continues to declare that the Gaels could not have been strangers in the far-off ages in the south-west of Europe.

Port na curaich, in the island of Iona, enables the traveller to determine the exact locality where St. Columba first landed from the coracle or wicker-boat covered with hides, that conveyed him from Ireland.

The citations which have been adduced from the Topography of Cornwall furnish satisfactory evidence, that the substratum of that Topography is Gaelic ; and that the conclusion may in all fairness be drawn that Celts, whose language was Gaelic, had their home in that portion of England before the Cymry had a distinctive existence in Britain, and long before the days of Arthur and the Knights of the Round Table.

In his Lectures on *The Science of Language* (1st Series, Lecture II.), Max Müller remarks "that it is not in the power of man either to produce or prevent a continuous change in language. * * * Language cannot be changed or moulded by the taste, the fancy or the genius of man. * * * Language exists in man, and it lives in being spoken. * * * A language as long as it is spoken by anybody lives and has its substantive existence." Cornish is no longer spoken. In 1860 Prince Louis Lucien Bonaparte, in company with the Vicar of the Parish of St. Paul, Cornwall, erected a monument to the memory of Dorothy Pentreath, who died in 1778, and who is said to have been the last person that could converse in Cornish. In the preface to his Glossary of Cornish names, Dr. Bannister remarks, on the authority of Polwhele, that Williard Bodenner, who died about the year 1794 at a very advanced age, could "converse with old Dolly," and "talked with her for hours together in Cornish." Whether Dolly Pentreath was the last person who spoke Cornish or not, it is admitted that about the close of the last century, Cornish ceased to be a spoken language.

It is beside the purpose of this paper to examine the question, as to what place or places may have been included under the designation, *Cassiterides.* The author of an article on Cornwall in the *Encyclopædia Britannica* affirms "that there can be no doubt that Cornwall and Devonshire are referred to under the general name of the *Cassiterides* or the Tin Islands." In adverting to the *Scilly Isles* in his Celtic Britain (p. 44–47), Rhys states that "they have been sometimes erroneously identified with the Cassiterides of ancient authors. * * * There is not a scrap of evidence, linguistic or other, of the presence of Phœnicians in Britain at any time." Warner, in his *Tour Through Cornwall,* which was published in 1809, contends (p. 199) "that it is a fact irrefragably established that the Phœnician colonists of Gades trafficked to the south-western coast of Cornwall from high antiquity." Betham, in his *Gael and Cymbri* (p. 64), asserts "that the Phœnicians were called so, because they were a nation of sailors or mariners, as the word *Phenice* intimates—*felne,* a ploughman, and *oice,* water—a *plougher of the sea.*" A wide divergence of opinion thus prevails as to the relation of the Phœnicians to the south-west of England in the far off centuries. Betham contends that the word *Scillies* or *Sceleys* is derived from *scal,* noisy, and *uag,* rocks; and that, accordingly, the signification is *sacred sea cliffs.* He further states that "*Scylla* or *Scylleum*, the names of promontories in Greece and Italy, and the British and Irish seas; the *Scillies* off Cape Belerium in Cornwall, and the *Sceligs* off Cape Bolus in Kerry, stand in the same track of Phœnician navigation with Cape Belerium near Corunna in Spain.' *Scylla* is derived by Greek writers from *σκύλλω*, to *skin*, to *mangle*. *Scilly* in Cornish means to *cut off*. Hence it has been held that the Scilly Isles received that appellation because they "are cut off from the insular Continent." Joyce, in his *Irish Names of Places* (vol. 1, p. 420), states that *Sceilig* (skellig), according to O'Reilly, means a rock. The form *Scillic* occurs in Cormac's Glossary in the sense of splinter of stone, and O'Donovan, in the Four Masters, translates *Sceillic* sea-rock." I am disposed to believe that the Gaelic word *sgaoil*, to spread or scatter, enters into *Scilly*, and that the Scilly Isles were so designated in consequence of their scattered appearance. It is true that Scilly is likewise regarded as equivalent to *Sulley*, and that thus construed the term means *flat rocks of the sun* (lehau sul).

Gaelic roots appear in the Topography of the Scilly Isles, e. g. :—

Bryher, *bre braigh*, brae ; *hir shior*, long.

Tean, *tiadhan*, a little hill.

Pool, *poll*, a *hole*, mud.

Carn Morval, CARN, a *heap* ; *mor*, large ; *baile*, town.

Peninnis Head, *ceann*, head ; *innis*, island.

Carraigstarne, *carraig*, a rock ; *stairn*, noise.

Carnlea, *carn*, heap ; *liath*, hoary.

Tolmen Point, *toll*, a hole.

Porth Minick, *port*, a harbour ; *manach*, monk.

Port Hellick (the bay in which the body of Sir Cloudesley Shovel was washed ashore) is derived from *port*, a harbour, and *sheilich*, *seileach*, a willow tree.

Drumrock, *druim*, a ridge.

Sufficient evidence has, I trust, been adduced to prove, that the Topography of Damnonia is fundamentally Gaelic; and that before the arrival or the distinctive existence of the Cymry, Celts who spoke Gaelic inhabited the south-west of England in such numbers and for such a length of time, as to give to the streams and hills and headlands those names which have come down to our own day, and which still reveal their own Gaelic lineage.

Many attempts have been made to explain the Etymology of the word *Britain*. Betham is of the opinion that the Phœnicians gave the name *Briteen* (*brith*, painted, and *daoine*, men) to the people whom they found in Britain; and that the word *Britain* is compounded of *brit*, painted, and *tana*, country, the meaning thus being *the country of the painted people*. It has also been maintained that *Britain* derives its name from *Prydain*, the first legendary King of Britain, after whom the island was called *Ynys Prydain*, *The Island of Prydain*. Before the Christian era *Albin*, or *Albion*, was an appellation by which the countries now known as England and Scotland were designated. *Albin*, or *Albion*, is now restricted to Scotland, and is the term which the Scottish Gaels apply to that country. *Albin* is in all likelihood compounded of *alb*, *alp*, a mountain, and of *fhonn*, *fonn*, a country, the import of the word thus being *the country of hills or mountains*. The conjecture has been advanced that the name *Britain* is composed of *braigh*, a top, and *tonn*, a wave, *braitoin*; and that that appellation was given to Britain in consequence of its lofty coast line as seen from the opposite shores of Gaul. *Breac*, variegated, and *innis*, an island, *Breacinnis*, is another derivation which has been assigned for the word in question. It is almost needless to remark, that although such interpretations may be ingenious, very much that is fanciful enters into them. An interpretation of a more plausible and accurate kind has recently been given by Prof. Rhys, who maintains that "the Greeks of Marseilles obtained the word *Britanni* from the natives of the south-west of England, who brought their tin to market, and in whose country the only Celtic speech in use was as yet Goidelic." He discovers in the word *Britain*, *Bretnais*, *brat*, *brattan*, the Gaelic term for a covering or a *cloak*,—an argument in support of the theory, that the Celts assumed the name which the Romans afterward wrote *Britanni*, to distinguish themselves as a *clothed* or *cloth-clad* people (*breid*, a piece of cloth) from the naked races who preceded them in the occupation of the British Isles. Though, amid so many explanations of the origin and Etymology of the word *Britain*, it appears to be impossible to arrive at a solution that can be regarded as in all respects satisfactory, it may at least be conceded that the term in question is rather Cymric than Gaelic. *Breathnach* is the name which is applied in Irish Gaelic to a Welshman. *Dumbarton*, which was once the capital of a Kingdom of Britons in the valley of the Clyde, is compounded of *Dun*, a fort or hillock, and *Breatunn*, *i.e.*, *the fort of Britain*, and, as we may fairly argue, *of the Britons*—if those to whose capital the Scottish Gaels gave the name *Dun-Breatuinn*—, the name by which Dumbarton is known to the Scottish Gaels of our own day. Such words as *Frangach*, a Frenchman; *Sasunnach*, an Englishman, a Saxon; and *Breatunnach*, a Briton, are merely adaptations to the Gaelic language of *France*, *Saxon*, *Briton*. The Scottish Gael is wont to characterize the inhabitants of Scotland as *Albannaich*. *Is Albannach mise*, I am a Scotchman. The word in Scottish Gaelic for a *British subject* or for *the British* is *Breatunnach*, *na Breatunnaich*. The name *Galbraith* is in Gaelic *Mac a' Bhreatunnaich*, *the son of the Briton*, and, as we may infer, the son of one who belonged to a different people from the Gaels among whom he may have resided, and whose name is perpetuated in the common surname *Galbraith*.

Whether the exact Etymology of *Britain* can ever be ascertained or not, or whether it may have more than one derivation, the usages of the Gaelic language go to show that it is *Cymric* and not Gaelic; and that, although it passes as current coin in the words *Breatunn* and *Breatunnach*, such words found their way into Gaelic from another source; and even when they are commonly employed, they carry with them reminiscences of an origin that is not purely Gaelic, but is to be construed as indicating that the Gaels of a far-off time adopted such words to describe the members of a race with whom they came frequently in contact, and who, as at Dumbarton, had their home for a time in the immediate neighbourhood, if not in the midst, of the Scottish Gaels.

Dr. Scadding, and Messrs. Buchan and Rouse made remarks on the subject of the paper.

SEVENTH ORDINARY MEETING.

The Seventh Ordinary Meeting of the Session 1884-'85, was held on Saturday, December 13th, 1884, the President in the Chair.

Donations and Exchanges received since last meeting:

1. Appleton's Literary Bulletin, Nos. 11 and 12, Vol. III.

2. Annual Report of the Curator of the Museum of Comparative Zoölogy at Harvard College for 1883–'84.
3. Science, Vol. IV., No. 96, for December 5th, 1884.
4. Transactions of the Manchester Geological Society, Vol. XVIII., Part II., Session 1884–'85.

The minutes of last meeting were read and confirmed.

Mr. J. F. Brown, B.A., and Mr. Martin Luther Rouse were elected members of the Institute.

Mr. Martin L. Rouse read a paper "On the Number, Nature and Musical Character of Vowel Sounds."

Premising that no complete classification of the simple vowel sounds in existence had ever been made, he drew especial notice to the omissions and the anomalies of Walker, Webster, Pitman and Nuttall. Then, by drawing analogies between the pronunciation of English words and comparisons between their utterance and that of French, German and Italian ones, he constructed a table of sixteen true vowels, eight long and eight correlatively short (indicating by examples which of them occurred in the four chief tongues of western Europe)—the vowels heard in the English and French words, *boom* (long), *bush* (short); *mote*, *morality* (or *maux*, *mot*); *dawn*, *don*; *path* (or *pâte*), *patte*; *bur*, *but*; *age*, *edge*; *su*, *suspendre*; *keen*, *kin*. He further resolved six diphthongs used in the four languages into components enumerated in his table; and, departing from all previous traditions, he gave a place among the diphthongs to the *a* of *care* or *ai* of *air*, while he found this diphthong to be unique in possessing a short correlative—the *a* of *carry* or *at*. Being now enabled to test the comparative richness of the languages in vowel sounds, whether simple or compound, he did so not only by counting up the examples in the table itself but by marking from the table every first occurrence of a sound in choice passages of English, French and German poetry (Italian being completely shut out of the competition by the table). The result was greatly in favour of the German; but that language, on the other hand, was shown to be disfigured by oft-recurring gutturals, as was not the case with English, the least monotonous of the remaining three.

The speaker then announced that he had completed a discovery of which only isolated fragments had hitherto been made—of music in the vowels—the eight long simple sounds that he had discriminated making up two perfect musical scales: the one when whispered, the other when spoken. In each the music ascended from the *oo* in *boom*, regularly through the list to the *ee* in *keen;* and in each the *oo* sound fell upon the same note, which in the speaker's voice was *e* below the bass stave on a high-pitched piano. But the vowels of the whispered scale mounted in the intervals *e*, *a*, *b*, *c* sharp twice repeated, and the latter half of them at least emitted also a fainter resonance descending in the opposite order; whereas the spoken scale was throughout single and chromatic.

Lastly, Mr. Rouse adverted to the use of vowel interjections in common by nations widely severed in habitation and kinship—a permitted relic, as he thought, of the time before the confusion of tongues; and he showed the remarkable fact that each one of the long simple sounds he had distinguished was used in English to express a different emotion—*oo* or *oogh* for anger, *oh* for surprise, *aw* for wonder, *ah* for sorrow, *urgh* for disgust, *eh* for inquiry, *üch* for contempt, and *eegh* for pain.

Remarks were made by Dr. Workman, and Messrs. VanderSmissen, Boyle, Keys, Mowat, Galbraith and Macdougall.

After the reading of Mr. Rouse's paper, Mr. John Phillips introduced the subject of the "Centrifugal Forces of the Planets."

EIGHTH ORDINARY MEETING.

The Eighth Ordinary Meeting of the Session 1884-'85, was held on Saturday, December 20th, 1884, the President in the Chair.

The minutes of last meeting were read and confirmed.

Donations and Exchanges received since last meeting:

1. Monthly Weather Review, November, 1884.
2. Journal and Proceedings of the Hamilton Association for 1882-'83, Vol. I., Part I.
3. Canadian Entomologist, Vol. XVI., No. 10, October, 1884.
4. Science, Vol. IV., No. 97, December 12th, 1884.
5. Second Annual Report of the Bureau of Ethnology, Smithsonian Institution, 1880-'81.
6. Boletin de la Academia Nacional de Ciencias in Cordoba (Republica Argentina), Tomo VI., Entregas *2a* & *3a*.

Mr. Aubrey White was elected a member of the Institute.

Mr. Sandford Fleming, C.M.G., read the following paper on

UNIVERSAL OR COSMIC TIME.

On the first day of the month, the President of the United States, in his message at the opening of Congress, referred to the International Meridian Conference lately convened in Washington, in the following words :—" The conference concluded its labours on the first of November, having with substantial unanimity agreed upon the meridian of Greenwich as the starting point whence longitude is to be computed through one hundred and eighty degrees eastward and westward, and upon the adoption for all purposes for which it may be found convenient of a universal day, which shall begin at midnight on the initial meridian, and whose hours shall be counted from zero up to twenty-four."

The Canadian Institute is peculiarly interested in this announcement. No society, literary or scientific, has taken a more important part in the initiation of the movement to reform our Time System, of which the success is, to some extent, indicated in the President's words. It therefore appears to me fit and proper that I should recall to your attention the various steps which, from time to time have been taken so that we may possess a record of the events which have led to the now almost general recognition of the necessity for a new notation.

Six years ago on several occasions the meetings of the Institute were engaged in discussing the subject of Time-reckoning and the selection of a Prime Meridian common to all nations. Papers were read and arguments were advanced, with the view of showing the necessity of establishing a cosmopolitan or universal time, by which the events of history might be more accurately recorded, and which would respond to the more precise demands of science, and generally satisfy the requirements of modern civilization. The proceedings of the Institute for January and February, 1879, give at considerable length the views submitted and the suggestions offered to meet the new conditions of life. While on one hand it was argued that the introduction of a comprehensive scheme by which time could be universally reckoned was highly desirable, it was equally maintained that the determination of a common Prime Meridian for the world was the key to its success, and that the establishment of such a meridian, as a zero, recognized by all nations, was the first important step demanded.

These proceedings were brought under the notice of His Excellency the Marquis of Lorne, then Governor-General of Canada. In the name of the Institute, they were submitted, in the form of a memorial, with the hope that His Excellency would see fit to lay them before the Imperial Government. That they would by these means obtain the attention of the several scientific bodies throughout Europe, and that some general systematic effort would be made in the right direction to secure the important objects sought to be attained.

Through the good offices of His Excellency, copies of the Canadian Institute proceedings found their way to the British Admiralty, the Astronomer Royal, Greenwich, The Astronomer Royal for Scotland, Edinburg, The Royal Society, The Royal Geographical Society, The Royal Astromomical Society, The Royal United Service Institute, and other societies of eminence and weight in the United Kingdom. Copies of the papers were likewise sent through the Imperial Government to the governments of the following countries, viz.:

FRANCE,
ITALY,
THE UNITED STATES,
AUSTRIA,
BRAZIL,
JAPAN,
SPAIN,
SWITZERLAND,
GREECE,
GERMANY,
NORWAY AND SWEDEN,
RUSSIA,
BELGIUM,
DENMARK,
THE NETHERLANDS,
PORTUGAL,
TURKEY,
CHINA.

In the year following, the American Metrological Society issued a Report of the Committee on Standard Time. It bears the name of Mr. Cleveland Abbe, the Chairman of the Committee, and the date of May, 1879. It draws attention to many of the causes calling for the establishment of accurate time, and the attempts made since the establishment of the electro-magnetic telegraph to make the notation of time synchronous. While pointing out that this result had been obtained in Great Britain through the efforts of Professor Airy, Mr. Cleveland Abbe gave a list of the various observatories on this continent which are in possession of the necessary apparatus and force proper to furnish astronomically accurate time by telegraph. Writing in February, 1880, while giving the resolution adopted by the society, recommending the adoption of accurate time by telegraph from an established astronomical observatory, Mr. Cleveland Abbe points out that the subject of accurate time had been taken up by the Horological Bureau of the Winchester Observatory of Yale College, and that the most perfect apparatus had been received for the purpose of distributing New York time to the highest degree of uniformity and accuracy.

Mr. Cleveland Abbe's own remarks on the subject are of high value. He forcibly points out the difficulties and inconvencies under which railway operations in America labour from the want of a proper system of time. To show this fact in greater force, he gives the seventy-four standards then followed. These several standards he proposed to set aside and replace by standards each differing one hour or 15° of longitude.

While recommending this course, the report sets forth that the change could only be regarded as a step towards the absolute uniformity of all time-pieces, and the Society passed resolutions, that absolute uniformity of time is desirable; that the meridian six hours west of Greenwich should be adopted as the national standard to be used in common on all railways and telegraphs, to be known as "Railroad and Telegraph Time;" that after July 4th, 1880, such uniform standard time should be the legal standard for the whole country, and that the State and National Legislatures should be memorialized on the subject.

Mr. Cleveland Abbe in this report alluded to the previous proceedings of the Canadian Institute.

The active sympathy of the Marquis of Lorne greatly aided the movement of Time-reform in its early stages. In 1879, in his official position as Governor-General he had been the recipient of the papers published by the Canadian Institute, and had transmitted them to Great Britain, and through the Imperial Government to the several European centres. In 1880, it was learned that the report to the American Metrological Society above alluded to, would shortly be issued. Accordingly, advance copies were obtained from New York, and, together with additional papers issued by this Institute, they were transmitted by His Excellency to the following

European Societies, and the special attention of their members was directed to the documents themselves :

1.	The Institut de France	Paris.
2.	Societè de Geographie	Paris.
3.	Societè Belge de Geographie	Brussels.
4.	Königlich Preussische Akademie der Wissenschaften	Berlin.
5.	Gesellschaft für Erdkunde	Berlin.
6.	Kaiserliche Akademie der Wissenschaften	Vienna.
7.	K. K. Geographische Gesellschaft	Vienna.
8.	Nicolaevskaia Glavnaia Observatoria	Pulkova.
9.	Imper. Rousskae Geograficheskoe Obschestov	St. Petersburg.
10.	Imp. Akademia Nauk	St. Petersburg.
11.	Societè de Geographie	Geneva.

By this means attention was obtained for the subject in Europe, and when I submit evidence of the fact, I think you will agree with me, that no little of the success which has attended the movement is owing to our late Governor-General. We must all acknowledge how much we are indebted to him for the great personal interest he has always shown on the subject. We are certainly warranted in forming the opinion, that the dissemination of these papers, under such distinguished auspices, awakened attention to the arguments they contain, and prepared the way for the subsequent action taken at the International Geographical Congress at Venice, at the Geodedic Congress at Rome, and more recently at the Conference at Washington.

Mr. Wilhelm Förster, director of the Berlin Observatory, enters into the subject at length in a paper "Zur Beurtheilung Einiger Zeitfragen, insbefondene gegen die Einfuhrung einer deutschen Normalzeit." [A Review of some considerations on Time, especially against the introduction of German National Uniform Time].

Mr. Förster proceeds to say : The British Government is now transmitting, through its representatives, although at the same time it declares itself neutral, a proposition which has been published by a society of scientific men in Canada, which aims at the establishment of a cosmopolitan normal datum (Prime Meridian) and of Universal Time, and also the establishment of 24 meridians of an hour apart, by which local time will be absorbed. The first proposal, Mr. Förster describes as an important sign of the times and evidently favours it.

He strongly protests against the establishment of a national German time; but for railway business, and for such matters of communication which require precision, also for the form of expression of all scientific relations to time, Mr. Förster points out that a universal time common to the whole world is to be recommended.

Dr. G. Von Boguslauski, in the *Verhandlungen der Gesellschaft für Erdkunde*, (transactions of the Geographical Society of Berlin), commends the new scheme as it has been put forth in the Canadian Institute papers, and foretells that it will be a matter of fact in a short time.

Col. Aden, Director of the Military School, Belgium, has two papers in the *Bulletin de la Société Belge de Geographie.* He supports the proposal to establish universal time, and expresses the opinion that longitude throughout the world should have a common notation, dating from one universally accepted Prime Meridian.

Col. Wauverman, President of the Geographical Society of Antwerp, in the Bulletin of that society, 1882, advocates the change, and with ability meets the arguments raised against it, showing them to be groundless and arising from a want of thoroughly understanding the question.

In Spain, the proposals have met with full support. All the papers issued by the Canadian Institute have been translated and published in a pamphlet of 80 pages by the Revista General de Marina. The translator, Don Juan Pastorin, an officer of the Spanish navy. is warm in his commendation of the scheme, and takes a wise and comprehensive view of the whole question. The Spanish Government secured the advantage of this gentleman's services as a delegate to the Washington Conference.

M. Otto Struve, the well-known Astronomer and Director of the Imperial Observatory, Pulkova, reports on the papers transmitted by Lord Lorne to the Imperial Academy of Sciences, St. Petersburg. He gives his adherence to the establishment of Universal Time, based, as suggested, on a Prime Meridian common to the whole globe, and strongly advocates counting the hours in one series up to twenty-four.

In England, the Royal Society considered favourably both the establishment of a Universal Time and the determination of a common Prime Meridian, while the pesent Astronomer Royal, Mr. Christie, takes a favourable view of the question, his predecessor, Sir G. B. Airy, reported in a qualified manner. The report of the Astronomer Royal for Scotland, Prof. Piazzi Smith, is unfavourable. The latter documents have already been submitted to the Institute.

In Italy, the Italian Geographical Society has given its countenance to a work by Mr. Fernando Bosari, who, in a pamphlet of 68 pages, reviews the whole question at length, and lays down three principles ; 1. The determination of a zero meridian ; 2. The establishment of cosmopolitan time based upon it ; 3. The notation of the hours from 1 to 24 in a continuous series.

The question of Universal Time and the selection of a Prime Meridian is discussed with ability in a paper published by M. Thury, professor at the University of Geneva.

At the meeting of the Association for the Reform and Codification of the Laws of Nations at Cologne, Prussia, in 1881, the question of regulating time on the new system was considered and resolutions moved.

In the same year (1881), the subject occupied the attention of the International Geographical Congress at Venice, at which a delegate from the Canadian Institute attended. The general question was warmly discussed, and resolutions adopted. The appointment of an international conference to meet at Washington, specially to consider the question, was then suggested by the Canadian delegate. The president of the Congress communicated the resolutions to the Italian Government; and Prince Teano, on behalf of the Italian Government, undertook to conduct the official correspondence. Out of this appears to have sprung the important discussion at the meeting of the International Geodetic Association at Rome, in October, 1883, when the utility of Universal Time was recognized, and a special international conference for the establishment of a zero meridian for longitude and time recommended.

Turning to this side of the Atlantic, the question of regulating time for railway, telegraph, and civil purposes generally, was considered at the Convention of the American Society of Civil Engineers, held at Montreal, June 15, 1881, and a committee of men engaged in the management and familiar with the economy of railways, appointed to examine the question. The committee has reported from time to time. They recognized that a proposition to reform the general time system of the country was a problem beset with difficulties, but it did not appear to them insolvable. It was felt, however, that the question affected so many interests that any change could only be effected by general concurrence.

To attain the end proposed by this society, the papers bearing on the question were printed, and a scheme modified on the proceedings of the Canadian Institute was drawn up, under the title of "Cosmopolitan scheme for regulating time."

I may briefly recall the features of the scheme.

There should be one standard of absolute time, a Universal Day, based on the mean solar passage, at one particular meridian, the Prime or initial meridian for computing longitude. This Prime Meridian, together with the universal day, to be observed by all civilized nations.

There should be 24 secondary or hour meridians established, 15 degrees of longitude apart, beginning with the Prime Meridian as zero.

To distinguish the universal day from local time, it should bear the title of "Cosmic Day."

[NOTE.—I may remark, that the designation "Cosmic" was first suggested, independently, by two Canadian gentlemen widely separated, by Mr. R. G. Halliburton, then in Algiers, and by Mr. Thomas Hector, of Ottawa. The etymology commends the use of the word. It has been accepted by a number of societies and by many individuals as appropriate and applicable.]

Cosmic time is intended to be used to promote exactness in chronology, and to be employed in astronomy, navigation, metrology and in synchronous observations throughout the world. To be employed in ocean telegraphy and generally in all operations non-local in character.

The several twenty-four meridian to be used as standards local time around the globe. Applying the system to North America, the effect would be to reduce the standards to four or five, as suggested by the metrological society.

A circular, dated March 15th, 1882, signed by Mr. John Bogart, the Secretary of the American Society of Civil Engineers, was forwarded to the leading men in railway direction, either as general managers, superintendents or engineers, and to men of scientific attainments throughout the United States and Canada. The papers thus circulated contained eleven questions, and catagorical replies were invited to them.

Replies were received and reported on at a convention of the society, held in Washington on the 17th May, 1882. The scheme submitted was generally and cordially approved.

An emphatic and unanimous opinion was expressed, that there should be established as early as possible a comprehensive system of Standard Time for North America.

Of those who replied to the queries, ninety-five per cent. favoured the idea that there should be a common agreement between the standards of time in all countries. That while we must primarily look to our own convenience on this continent, it is proper to aim at eventually attaining general uniformity among all nations.

Seventy-six per cent. were in favour of reducing the standards in North America so that they would differ only by intervals of one hour, and ninety-two per cent. were in favour of a notation of the hours of the day in a single series from 1 to 24, instead of in two divisions each of twelve hours.

The character of the replies received indicated that a remarkable unanimity of opinion prevailed in every section of the continent heard from. The Convention accordingly resolved that an attempt should be made to obtain European concurrence to the selection of a Prime Meridian on which a time system could be definitely based. But, failing to obtain this recognition, the people of the Western Continent should determine a zero meridian for their own use and guidance.

It was thereupon resolved to petition the Congress of the United States to take the matter into consideration. The American Metrological Society about the same time adopted a similar proceeding. The consequences were that a Joint-Resolution of the House of Representatives and the Senate was passed authorizing the President of the United States to call an International Conference to fix on and recommend for universal adoption a common Prime Meridian to be used in the reckoning of longitude and in the regulation of time throughout the world.

On the meeting of the American Association for the Advancement of Science in Montreal, in July, 1882, the subject was brought forward, and all the documents were submitted and discussed. It was agreed that the Association should co-operate with other bodies in furtherance of the movement.

On two occasions the Royal Society of Canada has had its attention directed to the matter, and this body has assisted in furthering the determination of the problem by its co-operation and by correspondence with the Government.

Some delay took place in summoning the International Conference by the President, in consequence of lengthy correspondence on the subject between the United States Government and the Governments of other countries. In the meantime a decision with respect to the regulation of local time had been anticipated by the railway authorities in North America, who adopted the system of hour standards which had been prominently brought forward as described.

On November 18th of last year (1883) the new system of regulating railway time on this continent came into operation. There had been several preliminary meetings of railway managers; the last meeting was a Convention held in Chicago the previous October, and it was then determined immediately to carry out the change.

Mr. W. F. Allen, the secretary of this Convention, who also took a prominent part in effecting the adoption of the change, has given a history of the events leading to it. Upon this gentleman mainly fell the labour of arranging details, and he executed the difficult duties assigned to him with consummate ability. In the words of the historian, the transition from the old to the new system "was put into effect without any appreciable jar, and without a single accident occurring." According to this authority the first newspaper to advocate some change was the *Railroad Gazette* for April 2, 1870, and it is claimed that as early as 1869 Prof. Charles F. Dowd, Principal of Temple Grove Ladies' Seminary, Saratoga Springs, proposed a system of meridians based on the meridian of Washington at intervals of one hour, by which railways should be operated, and that an expression of his views was placed in the hands of the President of the New York and Canada Railroad. The proposition appears to have attracted attention in the *Travellers' Official Guide* of 1872. In 1873 it was brought before the Railway Association of America, not now in existence. A committee was appointed to examine into its merits; they failed to recognize its necessity, and recommended that the question of national standard time for use on railways be deferred until it more clearly appeared that the public interests called for it.

Mr. Dowd's efforts to introduce a national standard time to meet the difficulties which were being developed were at the time imperfectly appreciated. He, however, has had the satisfaction of seeing a scheme unanimously accepted, and put in operation, which in essential features does not materially differ from that which he advocated; and he himself attended at the meeting of the American Metrological Society, and took part in the proceedings when the details of the new time arrangements were officially narrated.

Prominent among those who have earnestly laboured to advance the movement of time-reform is the distinguished president of Columbia College, New York. Dr. Barnard has from the first taken the deepest interest in the question, and few men have done so much to bring it to a practical issue. In the proceedings of the American Metrological Society for 1881 will be found a paper prepared by Dr. Barnard in 1872, and presented to an association which has since assumed an international character, and known as the association for the Reform and Codification of the Laws of Nations. In this paper Dr. Barnard recommends the selection of Greenwich as the Prime Meridian for the world, and he submits the views he held at that early date, which at this hour are of peculiar interest. He points out that "it is becoming a matter of greater importance every day that there should be established some universal rule for defining the calendar day for all the world."

I have alluded to the valuable report of Professor Cleveland Abbe, of the United States Signal Service, to the Metrological Society, and I cannot deny myself the pleasure of acknowledging the services of the gentlemen with whom I have been associated on the special committee on Standard Time of the American Society of Civil Engineers, Mr. Paine, of New York; Mr. Theodore N. Ely, of Altoona, Pennsylvania; Mr. J. M. Toucey, of the Hudson River Railway; Professor Hilgard, Coast Survey, Washington; Professor Egleston, of Columbia College; General T. G. Ellis, of Hartford, now unfortunately deceased, and Mr. John Bogart, Secretary of the Society,

The American Society of Civil Engineers, since meeting in Montreal, in 1881, has made persistent and continuous efforts in the common interest to advance the movement of Time-reform, having greatly aided in bringing about the important change carried into effect a year ago. This society is now directing attention to a reform of scarcely less importance, the notation of the hours of the day. At the Buffalo convention in June last, this particular question received prominent consideration in the address of the President, as well as in the report of the special committee. Since that date a correspondence has taken place between the Secretary and the Railway Managers in the United States and Canada. Already replies have been received from the representatives of some sixty thousand miles of railway, ninety-eight (98) per cent. of whom have given expression to their sympathy with the movement, to abandon the old practice of halving the day, designating the two sets of twelve hours by the abbreviations A.M. and P.M., and are prepared to adopt a simple notation of 1 to 24 in a single series, The great telegraph interests of the country are likewise in full sympathy with it. The President of the Western Union Telegraph Company, Dr. Norwin Green, states that their telegraphic traffic is equal to the transmission of forty-four million messages a year, and the general adoption of the 24 o'clock system, as it has been designated, would be cordially welcomed by telegraphers. It would reduce materially the risk of errors, and to the company over which he presides, he says it would save the transmission of at least 150,000,000 letters annually.

The branch literature bearing on the two questions of Universal Time and the establishment of a Prime Meridian, has been enriched by a series of papers which have appeared during the past year in the *International Standard*, a magazine published in Cleveland, Ohio. These papers are by the following gentlemen connected with the International Institute :—Rev. H. G. Wood, of Sharon, Pennsylvania ; Professor C. Piazzi Smyth, Astronomer Royal for Scotland ; Professor John N. Stockwell, Astronomer, Cleveland ; Mr. Jacob M. Clark, C.E., New York ; Mr. William H. Searle. Pennsylvania ; L'Abbé F. Moigno, Canon of St. Denis, Paris ; Commodore Wm. B. Whiting, U. S. Navy ; Mr. Charles Latimer, C.E., Cleveland ; and others.

It will be seen from what I have submitted, that the proceedings have neither been few nor without success. That since this Institute published the first issue of papers on Time and Time-reckoning, the subject has received much attention on both sides of the Atlantic. Societies with kindred pursuits, men of recognized merit in the scientific world, have turned to its examination and aided in its development. Some few men have acted in concert. The labour of others have been independent. Some of these names I have been able to record, but I fear that I neglect to include many of eminence because they are not known to me. It is this varied and widely diffused effort which has rendered possible the realization of the practical results which I have the gratification to record, and all must equally join in the common satisfaction in the measure of success which has been achieved.

Six years back, when the subject was discussed in this hall, there were probably not a few who viewed the propositions then submitted as merely fanciful theories. Others who did not refuse to recognize their bearing, entertained the feeling that many grave difficulties presented themselves to interfere with any successful attempt to reform or modify usages so ancient as the computation of time. But the Institute, as a body, was hopeful. The action taken by the Council to extend the field of discussion and awaken the attention of foreign communities, evinced confidence, and we may now ask, was this confidence justified? What are the facts to-day? Twelve months have passed since an important change in the notation of Railway Time was made with general approval throughout the length and breadth of North America, a revolution in the usages of sixty millions of people has been silently effected and with scarcely a trace that it has happened. A proceeding which has been followed by events of equal importance. On the 1st of October last a body of accredited delegates from the different nations, on the invitation of the President of the United States, met in conference to consider the problem first submitted to the world by this Institute. The delegates were the representatives of twenty-five (25) civilized nations. The conference continued during the whole month of October, and, as a body, they came to conclusions affecting all peoples living under our theories of civilization.

It was early understood that a determination with respect to Universal Time was not possible without the general recognition of an initial meridian. Hence the importance attached to its choice, that it should be universally accepted.

For many years attempts have been made to effect the establishment of an initial meridian recognized in common by all nations, but every attempt hitherto had proved completely unsuccessful. It is therefore the greater cause for congratulation, that the efforts of the Washington conference have succeeded in its determination.

The discussions of the conference were long, and being carried on in different languages, could not have been of equal interest to all present. Translations became necessary, so that all the delegates might equally understand the propositions which were daily submitted. This necessary course prolonged the sessions and multiplied the adjournments. At last, however, the choice of a Prime Meridian was obtained. The following resolution was passed, the delegates voting by nations:

"*Resolved*, That the Conference proposes to the Governments here represented the adoption of the meridian passing through the centre of the transit instrument at the Observatory of Greenwich as the initial meridian for longitude.

The above resolution was adopted by the following vote:

In the affirmative:

AUSTRIA,
CHILI,
COLOMBIA,
COSTA RICA,
GERMANY,
GREAT BRITAIN,
GUATEMALA,
HAWAII,
ITALY,
JAPAN,
LIBERIA,
MEXICO,
NETHERLANDS,
PARAGUAY,
RUSSIA,
SALVADOR,
SPAIN,
SWEDEN,
SWITZERLAND,
TURKEY,
UNITED STATES,
VENEZUELA.

In the negative:

SAN DOMINGO.

Abstained from voting:

FRANCE AND BRAZIL.

AYES 22. NOES 1.

There was less difficulty and even greater unanimity displayed when the consideration of Universal Time was submitted. The Conference adopted the principle of a Universal Day without a single negative vote. The resolutions carried are substantially in accord with the essential principles, if not with the precise features of the proposals set forth in the proceedings of the Institute, published in 1879.

The resolution defining the Universal Day reads as follows: "*Resolved*, That this Universal Day is to be a mean solar day; is to begin for all the world at the moment of mean midnight of the initial meridian, coinciding with the beginning of the civil day and date of that meridian, and is to be counted from zero up to twenty-four hours."

This definition, taken in conjunction with the other resolutions of the Conference, is fraught with important consequences.

When it is mean midnight at Greenwich, that moment it is mean noon at the meridian 180° from Greenwich, as indicated by the solar passage. Hence the anti-Prime Meridian practically becomes the time-zero for the world.

The initial instant of the twenty-four hours of each successive Universal or Cosmic Day is the moment of mean solar passage on the Anti-Prime Meridian. The first hour of the Cosmic Day is at the solar passage on the meridian 15° westward This then becomes the 1st hour meridian. The second hour of the Cosmic Day is at the solar passage on the meridian 15° still further westward. This becomes the 2nd hour meridian. And so on in turn, each meridian which is an exact multiple of 15° from zero becomes an hour meridian corresponding in number with the numbers of the successive hours of the Cosmic Day.

The twenty-four hour meridians so determined come in the following order, viz. :

LONGITUDE EAST AND WEST.	HOUR MERIDIAN.	COSMIC TIME AT SOLAR PASSAGE.
ANTI-PRIME MERIDIAN.	ZERO.	THE DAY BEGINS.
165° East	1st Hour Meridian	1 o'clock.
190° East	2nd " "	2 "
135° East	3rd " "	3 "
120° East	4th " "	4 "
105° East	5th " "	5 "
90° East	6th " "	6 "
75° East	7th " "	7 "
60° East	8th " "	8 "
45° East	9th " "	9 "
30° East	10th " "	10 "
15° East	11th " "	11 "
Prime Meridian	12th " "	12 "
15° West	13th " "	13 "
30° West	14th " "	14 "
45° West	15th " "	15 "
60° West	16th " "	16 "
75° West	17th " "	17 "
90° West	18th " "	18 "
105° West	19th " "	19 "
120° West	20th " "	20 "
135° West	21st " "	21 "
150° West	22nd " "	22 "
165° West	23rd " "	23 "
160° West	24th " "	24 "

Thus the exact position of the twenty-four secondary or hour meridians is practically determined, and provision is thereby made for extending around the globe so as to secure complete uniformity, the hour system of regulating time which has been adopted with so much advantage in America.

These hour meridians, so designated, completely establish the relation between Cosmic time and longitude and likewise between Cosmic time and local time. Once every day the relationship will be prominently brought under the notice of every individual. Any one, for example, living on the 6th hour meridian, will know at noon that it is at that instant six o'clock Cosmic time; or, take a citizen of Toronto, the local time of which would be governed by the 17th hour meridian. At the instant of noon he will know that it is 17 o'clock Cosmic Time. Invariable time will thus agree with longitude, conversely longitude with time. The earth itself becomes the great chronometer, and in its daily relations the passage of the sun will everywhere be the index of Cosmic time.

The resolutions of the International Conference establish a means of reckoning time which promises, in the years to come, to be of the highest advantage to the human family. Cosmic time, or whatever name may be given to Universal Time applied to civil purposes is an entirely new feature. It has now obtained recognition by a properly constituted authority, although until recently, I believe, it has remained unconsidered. Astronomers have long had equinoctial time, which is absolute time, dating from an epoch determined by the sun's motion among the stars; beyond this I cannot find any nearer approach to the mention of Universal Time as now understood.

The conclusions of the Conference mark a new era. The civil time of England is adopted as Universal Time. It may be said that Greenwich time is already known on every sea, that it has been carried by British ships wherever British explorers and colonists and merchants have penetrated, but Greenwich time is the local time of Greenwich, and, heretofore, it has always been held as such. Universal time, based on the Prime Meridian of the globe, and recognized by the several civilized nations is an entirely different conception. As the time of the world common to every nation, it is held that the term Cosmic will better express that meaning than Greenwich. Cosmic and Greenwich time are identical, by accident, but the expressions imply two totally different ideas, and known national sensitiveness suggests the good taste and expediency of distinguishing the two ideas by different terms.

I am induced to add a few words in explanation of the principles of Cosmic time.

Time has been the subject of profound thought by many philosophic minds of the past. They have attempted to define it, and their definitions have been manifold. If we view the earth as a whole, and the conditions of the age in which we live, oblige us so to view it, I am unable to see that any one of the recorded definitions gives support to the ancient system of keeping count of time which we follow. Our ordinary usages imply that there is an infinite number of times, and they are based on the principle that time is dependent on local situation. Nothing can be more erroneous and misleading. It is this false principle entering into every detail of daily life which has led each insignificent locality on the circumference of the globe to claim the right to have its own time. It is self-evident that time is in no way dependent on locality, I will quote on this point but one authority, the great Sir Isaac Newton. "Absolute true and mathematical time of itself, and from its own nature, flows equally without regard to anything external."

Our finite minds are incapable of understanding fully what time is, but this much is perfectly clear to our reason. Time is a measureable quantity, it may be termed a flowing magnitude, and only as one such magnitude is it conceivable. A distinct and separate flow of time in each of the myriad localities throughout the universe is perfectly inconceivable. If time be anything it is a *unity* and not a *plurality*. The cardinal principle of Cosmic time is *unity*, and with unity as a fundamental idea of time it must be held that the Cosmic system is the only sound principle of reckoning, and that as the area of civilization broadens, it must in the end be recognized as applicable everywhere and for all purposes.

The conclusions of the International Conference are fruitful of results of high importance. They may be said to point to the opening of a new chapter in the world's annals. They make provision for a complete cessation of ambiguity in hours and dates. By Cosmic Time all events whatsoever will be systematically arranged according to their proper chronological order. The calendar days the world over consequently will begin at the one initial instant, and clocks will strike the same hour at the same moment in all longitudes.

But the new system can only be gradually introduced. The majority of mankind have firmly fixed ideas with regard to the passage of the day and the numbers of the hours by which their social habits are regulated. A proposal suddenly to change the old familiar succession of the hours will be misunderstood. The influence of custom is always powerful under any aspect. It is anticipated that this influence will be the one serious obstacle to be overcome. The belief, however, may be permitted that the change will be rendered easy when men understand that the numbers of such hours have been arbitrarily chosen; that there is no necessary connection between them and the position of the sun in relation to the earth in its daily rotation, and that whatever numbers may distinguish the twenty-four divisions of the day, the recurring phenomena of light and darkness will always regulate sleeping, waking, eating, and working, and all the routine of life in every locality. Noon has heretofore been associated in our minds with the hour of 12, but among the Jews noon was the 6th hour, and astronomers have almost invariably recognized it as the 24th hour. For a year back throughout the United States and Canada the agreement between 12 o'clock and precise noon has been at an end. It may be said that, except on four or five meridians, 12 o'clock is nowhere coincident with mean solar noon. This departure from an old usage must tend to unloosen the traditional idea that the mere numbers of the hours have any necessary connection with the position of the sun in the heavens. If this innovation has any effect it must help to pave the way for still further and more important changes than have yet been introduced. The meridians by which time is regulated in North America are 5, 6, 7 and 8 hours of longitude west from the Prime Meridian. It will only be necessary to move forward our clocks 5, 6, 7, and 8 hours respectively to bring them all into agreement with the time of the Prime Meridian which is Cosmic Time, and thus obtain complete uniformity. It cannot, however, be looked for that Cosmic Time will at once be adopted in ordinary affairs. A generation probably will pass away before it will obtain general acceptance. The difficulties to be overcome cannot be ignored, and we may assume that it will only be step by step that the change will be made, the more advanced nations taking the lead. On this continent positive progress has been made, to be succeeded before long, I do not doubt, by another advance in public opinion, and a general acceptance of the principles recently recognized. In the course of years the prejudices engendered by inherited customs will be greatly modified, and the masses will gradually have their minds familiarized with new ideas. It is a significant fact that the principles of the new system should be unanimously recommended by delegates from all civilized nations. I do not doubt that the several peoples they represent will sooner or later understand that one uniform reckoning of time for every purpose throughout the globe is the only rational system, and the one notation which in coming years will properly meet the necessities and requirements of mankind.

In these remarks I have narrated the events which have taken place on both sides of the Atlantic to influence and determine the conclusions which, a few weeks back, the President submitted to the Congress of the United States.

On this occasion I cannot think that I am entirely wrong when I venture to congratulate the Canadian Institute on the part which it has taken in the solution of this problem. It stands among the Societies who first considered this comparatively new question. Indeed, it may be claimed that the Institute is to some extent the pioneer Society in awakening the world to the advantages to be derived from the establishment of Cosmic Time..

In conclusion, I will avail myself of the words of an early President of the of the Institute, whose portrait for more than thirty years has adorned the hall in which we are now assembled. Referring to the results already effected in Time-reform and the prospects for the future, General Sir Henry Lefroy, in his address at the late meeting of the British Association in Montreal, remarked: "Whether we conceive its educational tendency or its influence on future intercourse of unborn millions, it is a somewhat remarkable evidence that agreement upon questions of general concern is not that unattainable thing which we are apt to consider it."

Questions as to the effect of the proposed change were put by Mr. Notman, Mr. Murray and Mr. Macdougall, and answered by Mr. Fleming. Mr. Carpmael referred to the Spanish translation of Mr. Fleming's previous papers. Dr. Meredith congratulated the Institute on its having taken the initial proceedings. The President also made some remarks on the subject.

The following Resolution was moved by Dr. E. A. Meredith, seconded by Mr. W. H. VanderSmissen, and passed :

> **"That the meeting, considering this as an exceptional case, desire to tender a cordial vote of thanks to Mr. Sandford Fleming, C.M.G., for his interesting communication on the subject of 'Cosmic Time,' and they wish, at the same time, to record their satisfaction that to one of the original members of the Institute is due the honour of being the first to bring prominently before the scientific world, through the medium of the Journal of the Institute, the important subject of Time Reform, and the adoption of uniform or Cosmic Time."**

PROCEEDINGS

OF

THE CANADIAN INSTITUTE,

SESSION 1884–'85.

NINTH ORDINARY MEETING.

The Ninth Ordinary meeting of the Session 1884-'85, was held on Saturday, January 10th, 1885, the President in the Chair.

The minutes of last meeting were read and confirmed.

The following gentlemen were elected members of the Institute:

George Ritchie, B.A., B.Sc.; Charles Ridout, Esq.; Alexander Macfarlane, M.A. D. Sc., F.R.S.E.

The following list of donations and exchanges received since last meeting was read:

I.—CANADA.

1. **Report of Progress, 1874-75. From the Geological Survey of Canada.**
2. **Figures and Descriptions of Canadian Organic Remains. Decade II. Graptolites of the Quebec Group, by James Hall, 1865.**
3. **Atlas of Maps and Sections to Report of Progress from the Commencement to 1863.**
4. **Geology of Canada. Palaeozoic Fossils, Vol. I., by E. Billings.**
5. **Palaeozoic Fossils, Vol. II., Part I., by E. Billings.**
6. **Palaeozic Fossils, Vol. III., Part I., by J. F. Whiteaves.**
7. **Mesozoic Fossils, Vol. I., Part I.**
   Mesozoic Fossils, Vol. I., Part III.
8. **Report on the Polyzoa of the Queen Charlotte Islands, by Rev. Thomas Hincks.**
9. **The Fossil Plants of the Devonian and Upper Silurian Formations of Canada, by Sir J. W. Dawson.**
10. **Report of the Fossil Plants of the Lower Carboniferous and Millstone Grit Formation of Canada, by Sir J. W. Dawson.**

11. The Fossil Plants of the Erian (Devonian) and Upper Silurian Formations of Canada, by Sir J. W. Dawson, Part II.
12. Preliminary Note on the Geology of the Bow and Belly River Districts, N. W. Territory, by George M. Dawson, 1882.
13. Descriptive Sketch of the Physical Geography and Geology of the Dominion of Canada, by Alfred R. C. Selwyn and G. M. Dawson, 1884.
14. Comparative Vocabularies of the Indian Tribes of British Columbia, by W. Fraser Tolmie and George M. Dawson, 1884.
15. Map of the Dominion of Canada, Geologically Coloured, from Survey, made by the Geological Corps, from 1842-1882
16. The Canadian Entomologist, Vol. XVI., No. 11.

II.—UNITED STATES EXCHANGES.

1. Science, Vol. IV., Nos. 98 and 99, Dec. 19 and 26, 1884.
2. Proceedings of the Academy of Natural Sciences of Philadelphia, Part II., May to October, 1884.
3. An Account of the Discovery of a Mastodon's Remains in Northborough, Worcester County, Mass., by Franklin P. Rice.
4. Bulletins of the Minnesota Academy of Natural Sciences, Vol. II., No. 4.
5. Proceedings of the Boston Society of Natural History, Vol. XXII., Part IV., Oct. 1883, Dec. 1883.
6. The American Journal of Science for January, 1885.
7. Journal of the Franklin Institute, January, 1885.

III.—BRITISH EXCHANGES.

1. Proceedings of the Royal Geographical Society, Vol. VI., No. 12, December, 1884.
2. Archaeologia Aeliana, Vol. X., No. 2, from the Society of Antiquaries of Newcastle upon Tyne.
3. Monthly Notices of the Royal Astronomical Society, Vol. XLV., No. 1, November, 1884.
4. Journal of the Royal Microscopical Society, Series II., Vol. IV., Part VI., December, 1884.
5. Journal of the Transactions of the Victoria Institute, Vol. XVIII., No. 71.

IV.—BRITISH COLONIES (EXCLUSIVE OF CANADA).

1. Proceedings of the Asiatic Society of Bengal, Nos. 8 and 9, August and September, 1884.
2. Records of the Geological Survey of India, Vol. XVII., Part IV., 1884, From the Colonial Museum, Wellington, New Zealand.
3. Geological Reports, 1879-80, 1881, 1882, 1883, 1884.
4. Fossil Corals.
5. Museum and Laboratory Reports, 8-18.
6. Fishes of New Zealand.
7. Meteorological Reports, 1873, 1875, 1877, 1880, 1883.
8. Tertiary Mollusca.
9. Manual of New Zealand Mollusca.
10. Manual of New Zealand Grasses.
11. Manual of New Zealand Coleoptera, Parts I. and II.

12. Diptera.
13. Biological Exercises, Parts I. aud II.
14. Handbook of New Zealand.
15. Catalogue of International Exhibition, 1879 (New Zealand Court).

V.—FOREIGN.

1. Correspondenz-Blatt der deutschen Gesellschaft für Authropologie, Ethnologie and Urgeschichte, XV. Jahrgang, No. 10, October, 1884.
2. Tesis leida en el Examen Profesional de Ingeniero Geografe, per Joaquin de Mendezabal Tamborrel.

Total 66 numbers.

Dr. Macfarlane read a paper entitled:

NOTATION FOR PHYSICAL UNITS.

The late Professor Clerk-Maxwell in his treatise on Heat says, "Every quantity is expressed by a phrase consisting of two components, one of these being the name of a number and the other the name of a thing of the same kind as the quantity to be expressed, but of a certain magnitude agreed on among men as a standard or unit." Heat, p. 75. When we apply this analysis to the expressions of quantities, we find that in many cases there is no notation for the latter component—the unit. The general expression for a velocity is v; what does this single letter denote? It must be viewed either as denoting both components, or else as denoting the numerical phrase and leaving the unit to be understood. When a particular velocity is expressed, both components are expressed, as for instance 123 feet per second. Now if v is the general symbol corresponding to 123, what is the general expression corresponding to *feet per second?* But further it is only in the simplest cases that we have a notation for the special unit; and the consequence is that in the specification of quantities, as in tables of constants, there is considerable trouble in ascertaining from the context what special unit is understood.

If we look into text-books on arithmetic and examine the rules given for the application of arithmetic, such as the Rule of Three, or the unitary method, we find that the difficulty which is met but not overcome, is to express the dependence of one quantity upon one or more other quantities. It may be objected that the *formula* meets the difficulty. Only partly, I reply, for the formula expresses only the numerical component, not the unit component. It is well known that a formula leaves much to be understood or to be discovered about the units involved. Besides, it is difficult to an elementary arithmetician to understand it so well as to be able to use it with intelligence.

These defects appear to me to be due to the want of a systematic notation for units. By a notation for a unit I mean something different from a name; the latter merely designates, the former shows the dependence of the unit upon more fundamental units. The chemical notation for a substance expresses the manner in which the substance is made up of the elementary substances; while its name, however derived, serves merely as a distinguishing mark. And just as the chemical notation for a substance may be used as a name for the substance, so the notation for a physical unit may serve as a name for that unit.

In a work, about to be published, on Physical Arithmetic, I make use of a notation for units, and I show how the notation can be applied in the reasoning out of problems. The analysis of a quantity upon which I proceed is threefold, namely, numerical value, unit, and, when necessary, descriptive phrase. For example, the letter x as used in geometry, denotes not only a number and a unit, but also a particular direction.

The progress of physical science has made us familiar with the idea of a system of units, and as specimens we have the centimetre-gramme-second system, and the foot-pound-second system. There is however no systematic notation for the units whether of the general system or of the particular systems. The notation which I propose is the logical extension of existing notation, and is in harmony with both the English language and the established notation of mathematics. The nature of the notation will be seen from the table appended.

We require letters to denote the fundamental units of length, time, mass, and temperature. Let L denote any unit of length, T any unit of time, M any unit of mass, and θ any unit of temperature. They are the units corresponding to the numerical values l, t, m, θ. The letters S, V, F, W, P, Q in the same manner stand for names.

When a unit depends directly upon two units, as S upon L long and L broad, the relation of the independent units is expressed by means of *by*. When a unit depends directly upon one unit and inversely upon another unit, the relation of the two independent units is expressed by *per*; for instance, the unit of velocity is expressed by L per T. The words *by* and *per* correspond to the signs × and ÷, or rather now used by scientific men instead of the cumbrous ÷.

Sometimes, as in the unit for conductivity, a bracket is required after *per* (just as in the case of a numerical expression a bracket is sometimes required after —), to show that the sign attaches to the whole of the unit included within the bracket. And as - followed by - is equivalent to +, so *per* followed by *per* is equivalent to *by*.

A rate of exchange may be expressed either by means of *per*, or by means of =. For example, 4·85 dollars per pound, and 4·85 dollars = pound. Here the sign = is read 'for every.' In the same way a velocity may be written v L per T, or v L = T. Again a conductivity can be expressed as

$$\text{k H per T per S per } (\theta \text{ per L}),$$

$$\text{or, k H per T per S} = \theta \text{ per L.}$$

A velocity has only one reciprocal, namely

$$1/\text{v T per L};$$

but a conductivity has several, as

$$1/\text{k } \theta \text{ per L} = \text{H per T per S},$$

$$\text{and } 1/\text{k H per T per } \theta = \text{S per L.}$$

Equations of the kind which occur in exchange have not, so far as I know, been adequately treated. They are more properly termed equivalences. In ordinary equations the units of the two sides are identical; in equivalences they are either different in nature or different in description. The equations of exchange are combined by what is called the *Chain Rule*; and in the work referred to I show that a development of that rule is the method corresponding to the analytical expression of a quantity. For example, to express a speed of 60 miles per hour in terms of kilometres per second:

1 kilometre .... = 1,000 metres.
1 metre .... = 39.37 inches.
36 inches .... = yard.
1,760 yards .... = mile.
60 miles .... = hour.
1 hour .... = 3,600 seconds.

$$\therefore \frac{36 \times 176 \times 6}{3937 \times 360} \textbf{ kilometres = sec.}$$

i.e. **·0268 kilometres per second.**

The C. G. S. system is obtained by substituting *centimetre* for L, *second* for T, and *gramme* for M. For θ the *degree centigrade* is used. Thus the unit of velocity is centimetre per second, and that of acceleration is centimetre per second per second. Many of those who study dynamics to pass examinations never attain to the idea of acceleration; they can grasp the idea of velocity, but they cannot discriminate the idea of velocity from it. Even some of those who write on dynamics show by their use of centimetre per second or foot per second as a unit for expressing an acceleration, either that they have not grasped the distinction, or that they do not see the importance of a distinctive notation. It must, however, be admitted that the author has the printer to reckon with; and the latter supposes, not unnaturally, that the repetition of the *per second* is a mistake.

In the C. G. S. System F is the *dyne* and W the *erg*. The notation for the unit of heat is *gramme of water* by *degree centigrade*; it is sometimes called the *gramme-degree*. The latter is a name formed after the manner of compounds, while the former is a notation expressing the nature of the dependence.

From the notation for a unit we can derive its dimensions, or the multiplier for changing from one set of fundamental units to another. Take for example the unit of force. Let l L new = L old, m M new = M old, and t T new = T old. From an inspection of the manner in which the units enter into the notation for the unit of force, we derive

$$m\ l\ t^{-2}\ F \text{ new} = F \text{ old}.$$

Properly speaking, the dimensions are the indices of $m\ l\ t$; in the above case 1, 1, and —2, while $m\ l\ t^{-2}$ is the multiplier for changing from one unit to another. From the notation for a unit we can infer the multiplier; but from the multiplier we cannot infer the notation.

By means of the notation we readily see what ideas or units are equivalent to one another. For example,

1 erg = gm by cm. per sec. per sec. by cm.;

therefore 1 erg per cm = gm by cm per sec per sec, and 1 erg per gm = cm. per sec. per sec. by cm. Thus the unit of force is equivalent to erg per cm, and erg per gm expresses the idea of potential. The rule is to change *by* into *per*, or *per* into *by*, when removing a unit from one side to the other.

The units encountered in electrical science are the most complex of all; and the labours of scientific men in overcoming them have had an indirect effect in advancing the methods of elementary calculation. It is, however, only the notation for the principal units P and Q in terms of L, M, T that is complex. Given P and Q the notation for the remaining units is simple enough. Of the two units of electric quantity the notation for the electrostatic unit is the same as that for the unit of magnetic pole, while the notation for the electromagnetic unit involves that for the magnetic pole.

General symbols for a unit such as M and V are of great service in elementary calculations apart from the use in a notation for derived units. The chemist is always using the phrases 'part by weight,' and 'part by volume;' these ideas are expressed by M and V.

NOTATION FOR GENERAL UNITS.

I.—*Geometrical.*

QUANTITY.	NOTATION.	DIMENSIONS.
Length	L	l
Surface	L by L, S	l^2
Volume	L by L by L, V	l^3
Angle	L arc per L radius	l^0
Sine	L opposite per L along	l^0
Curvature	Radian per L	l^{-1}

II.—*Kinematical.*

Time	T	t
Velocity	L per T	$l\,t^{-1}$
Acceleration	L per T per T	$l\,t^{-2}$
Angular Velocity	L arc per L radius per T	t^{-1}

III.—*Dynamical.*

Mass	M	m
Density	M per V	$m\,l^{-3}$
Mass-vector	M by L	$m\,l$
Momentum	M by L per T	$m\,l\,t^{-1}$
Force	M by L per T per T, F	$m\,l\,t^{-2}$
Pressure	F per S	$m\,l^{-1}\,t^{-2}$
Work	M by L per T per T by L, W	$m\,l^2\,t^{-2}$
Activity	W per T	$m\,l^2\,t^{-3}$

IV.—*Thermal.*

Temperature	Θ	θ
Heat	M of water by Θ, H	$m\,\theta$
Thermal capacity	M of water by Θ per M	θ

IV.—*Thermal* (*Continued*).

Specific heat	**M of water = M of substance**	**1**
Latent heat	**M of water by Θ per M**	**θ**
Rate of expansion, linear.	**L increment per L original per Θ increment**	**θ^{-1}**
" " cubical.	**V increment per V original per Θ increment**	**θ^{-1}**
Conductivity	**H per T per S per (Θ per L)**	**$m\,l^{-1}\,t^{-1}$**

V.—*Electrical.*

Quantity.	Notation.	Dimensions.	
		Electro-static.	Electro-magnetic.
Magnetic pole	$\sqrt{F}$ by L, P		$m^{\frac{1}{2}}\,l^{\frac{3}{2}}\,t^{-1}$
Intensity of field	F per P		$m^{\frac{1}{2}}\,l^{-\frac{1}{2}}\,t^{-1}$
Magnetic potential	W per P		$m^{\frac{1}{2}}\,l^{\frac{1}{2}}\,t^{-1}$
Magnetic moment	P by L		$m^{\frac{1}{2}}\,l^{\frac{5}{2}}\,t^{-1}$
Quantity of electricity	$\sqrt{F}$ by L, Q elect'static.	$m^{\frac{1}{2}}\,l^{\frac{3}{2}}\,t^{-1}$	
" "	F per P by $(L\ rad.)^2$ per L arc by T, Q electro-magnetic		$m^{\frac{1}{2}}\,l^{\frac{1}{2}}$
Intensity of electric field	F per Q	$m^{\frac{1}{2}}\,l^{-\frac{1}{2}}\,t^{-1}$	$m^{\frac{1}{2}}\,l^{\frac{1}{2}}\,t^{-2}$
Electric potential	W per Q	$m^{\frac{1}{2}}\,l^{\frac{1}{2}}\,t^{-1}$	$m^{\frac{1}{2}}\,l^{\frac{3}{2}}\,t^{-2}$
Electric density	Q per S	$m^{\frac{1}{2}}\,l^{-\frac{1}{2}}\,t^{-1}$	$m^{\frac{1}{2}}\,l^{-\frac{3}{2}}$
Electric Capacity	Q per (W per Q)	l	$l^{-1}\,t^{2}$
Current	Q per T	$m^{\frac{1}{2}}\,l^{\frac{3}{2}}\,t^{-2}$	$m^{\frac{1}{2}}\,l^{\frac{1}{2}}\,t^{-1}$
Resistance	W per Q per (Q per T)	$l^{-1}\,t$	$l\,t^{-1}$
Conductivity of a substance.	Q per T per S per (W per Q per L)		$l^{-2}\,t$

Messrs. Livingstone and Macdougall made some remarks and the President noted the small attendance of those able to discuss the subject of the paper as a reason for dividing the Institute into sections.

TENTH ORDINARY MEETING.

The Tenth Ordinary Meeting of the Session 1884-'85, was held on Saturday, January 17th, 1885, the President in the Chair.

The minutes of last meeting were read and confirmed.

The following list of Donations and Exchanges received since last meeting was read :—

1. **Catalogue of Canadian Plants, Part II., Gamopetalae, by John Macoun, M. A.**

2. The Canadian Practitioner for January, 1885.
3. Science, Vol. V., Nos. 100 and 101, Jan. 2nd and 9th, 1885.
4. Journal of the Asiatic Society of Bengal, Vol. LIII., Part I., No. 2, 1884.

Prof. Loudon read a paper on "The Spherical Aberration of Mirrors." This paper has been incorporated with a former paper by Prof. Loudon. (See *ante*, page 16).

The Hon. G. W. Allan then read the following paper on

SOME OF OUR MIGRATORY BIRDS.

There are few subjects connected with bird life, more interesting than the migration of these denizens of the woods and fields, as they come to us in Spring after many months of absence—or leave us again at the approach of autumn or the keen air of early winter to wend their way back to milder and more genial climates. To an observant lover of nature there is an especial charm in the recognition of the first notes of each winged visitant, heard almost before they are seen, and bringing back life and melody to our woods and fields after the long silence of winter; and so again in autumn, there seems to be a peculiar plaintiveness in the call-notes of the gathering flocks, as if bidding us farewell before setting out on their long journey.

Even winter, however, with its frosts and snows has its visitors, coming from still colder latitudes, spending a few brief weeks with us, and at the first approach of the sunny days and soft airs of Spring, wending their way back to the far North.

In the limits of a paper such as this I shall not attempt to offer anything like an exhaustive list of our birds of passage, I shall confine myself to giving, as it were, a rough sketch of the ornithological characteristics of each month as marked by the arrival or departure of some of the various species of our land birds.

To begin with the year, for winter, as I have said, has its visitors as well as summer, and from the icy shores of Greenland, and the frozen north, comes to us that beautiful little bird, the Snow Bunting Plectrophanes Nivalis, the harbinger of cold and stormy weather. Flying generally in large flocks, as their bodies are seen against the blue sky, they look almost like large snow flakes drifting before the wind.

So associated are they with storm and cold that in northern

Europe where they are also found in great numbers in winter, they go by the name, among the Swedes, of "Illwarsfogel" or bad weather birds!

The time of their arrival here varies with the character of the weather. In very cold winters I have seen them as early as 10th and 15th of December, and I have known them to remain in some seasons as late as the first week in March. They are said to make their appearance in Hudson's Bay at the end of March or early in April remaining there for a few weeks and then wending their way still further north to breed on the shores of Greenland or even desolate Spitzbergen! As the food of these birds consists almost entirely of seeds of various wild plants, their means of subsistence amidst the deep snows of winter would seem to be precarious enough. Nevertheless they become very fat, and in the Province of Quebec, where they are found in much greater numbers than here, they are slaughtered most mercilessly for the market, and among our French friends "snowbirds on toast," I am sorry to say, form a standing entree in the bill of fare of a fashionable dinner.

The snowy owl, Nyctea Scandiaca, one of the most beautiful of our rapacious birds, is another winter visitor, at one time very common even in this neighborhood. I have seen them in considerable numbers on the Island on the other side of our Toronto Bay in the months of December and January. Nothing can exceed the exquisite softness and beauty of their thick, warm plumage, which enables them to bid defiance to the severest cold, and as they are not overnice in their choice of food, rats, mice, fish and small birds, all seeming to come alike, they are in no danger of starving even in the most wintry weather.

During this and the next month when strolling through the park or even through some of our streets, where bordered by trees or gardens, the attention of the passer-by may sometimes be attracted by the very sweet and melodious call-notes of two or three handsome birds, busily engaged in feeding upon the tender buds of a maple or stripping off the berries of the mountain ash, and if his curiosity induces him to approach them more closely (and they are often extremely tame and fearless) he cannot but be struck with the beauty of the plumage of some of the number, the head and upper part of the breast and back of the male birds more especially being beautifully marked with delicate shades of orange and crimson. These birds are the Pine Grosbeak *(Pinicola Enucleator)*, a rare visitor in some years, but in severe winters it comes to us in considerable numbers, being met with, not only in our woods, but sometimes venturing fearlessly, as I have said, into the streets and squares of our towns. They occasionally do a good deal of mischief to the young buds of both fruit and ornamental trees.

During a very severe winter many years ago these birds came into my own grounds in great numbers. Observing that wherever any withered apples were left hanging on the trees in the orchard they were eagerly attacked and torn to pieces by the Grosbeaks, apparently for the sake of the seeds, I had a quantity of apples cut up and and strewed on the steps of the verandah of the house, and before long I had as many as ten or a dozen of these beautiful birds feeding at the same time, and so tame and fearless did they become, that they would allow the members of the family to watch them from the windows. They did not, however, always content themselves with the food thus provided for them, but did a good deal of mischief that winter to the young buds of the cherry and apple as well as many of the ornamental trees. They leave us generally about the end of March.

The Bohemian Wax-Wing *(Ampelis Garrulus)*, is another rare winter visitor only appearing in seasons when extreme cold has driven it down from more northern latitudes. In plumage it resembles very closely the Ampelus Cedrorum, the Cedar Bird, common Wax-wing, or Cherry Bird, so well known, as an active depredator in our gardens and orchards. The Bohemian Wax-Wing, however, is considerably larger and the colouring of the plumage, though very similar, is richer and deeper. It has the same curious horny tips like red sealing wax on the secondaries of the wings.

The Crossbills, both the Red Crossbill *(Loxia Curvicostra Americana)*, and the White-winged *(Loxia Leucoptera)*, have been classed as winter visitors only in Ontario, and so has that elegant little bird the Pine Finch *(Chrysomitris Pinus)*. I have met with all three, however, in the neighbourhood of Lake Simcoe during the summer, and the Crossbills undoubtedly breed in the pine and Hemlock woods and may be seen there all throughout the year.

The last of our winter visitors that I shall notice is the Shore Lark, *Eremophila Alpestris*. Speaking from my own experience, it is not often met with in this part of Ontario, though it is found occasionally and in low and marshy grounds on the shores of this lake, and I have also seen it frequently in the neighbourhood of Ottawa.

It feeds on the seeds of various grasses and weeds, and such insects as it can obtain at the season. Its call note is very soft and melodious, and I have heard the male bird in the early days of March utter a short but very sweet song. It is then just on the point of setting off on its migration northward and its plumage has begun to assume something of its summer brightness, the black tufts of feathers on the head and the crescent shaped patch of black on the throat of the male bird are then very conspicuous.

Sometimes as early as the last week of February, though generally in the first warm days in March the cawing of the crows is heard for the first time, and their harsh voices sound pleasantly to our ears because they are associated with the commencing spring.

It is true that occasionally in very mild winters one or two individuals do sometimes remain in particular localities, but these are exceptions to the general rule and they may fairly be classed among our migratory birds.

I have said that their voices sound pleasantly because they are associated with the coming spring, but for my own part, I confess, it is only at that particular season that I can listen to them with any degree of complacency. They are then doing good service in feeding upon noxious insects and vermin of many kinds, but as the spring advances and the various small birds begin to lay their eggs and hatch their young, the crow becomes the ruthless destroyer of both eggs and young, and scores of the eggs or young of our Song Sparrows, Warblers, Thrushes and various other birds fall a prey to its voracious appetite.

First among the arrivals in March of our smaller migratory birds is the Song Sparrow, *Melospiza Fasciata*, and its short but sweet song is the first to proclaim "that the winter is over and gone, and the time of the singing of birds is come." The time of its arrival, as I have noted it in various years, varies from the 16th to the 23rd of March, sometimes, in very backward springs, not until the first week in April.

Almost at the same time with the Song Sparrow comes the Robin (*Turdus Migratorius*), its cheery notes, whether heard from the top of some tall maple, or as it scuttles through the bushes of the shrubbery, or pipes its evening song from the roof of some lofty building, is one of the most welcome sounds in Spring. Indeed I know of none among all our feathered visitors so worthy of being cherished and protected. It comes about our lawns and dwellings, and if only unmolested will build its nest and lay its eggs and hatch its young under the very eyes of the household. Its cheerful notes are the first we hear on waking, for the Robin is abroad at early dawn, and through the live long day it is going and coming in quest of food for itself or its young, stopping every now and again for a short snatch of cheery song, and then, as the sun goes down, perched on some tree, or it may be high up on the gable of some lofty building, it will pour forth its sweet notes continuously—sometimes for half an hour or more; the last of all the grove to relapse into silence. The quantities of grubs, caterpillars, cutworms, crickets and grasshoppers which are captured and devoured by the Robin and other thrushes is something marvellous; and as the Robin not unfrequently raises three broods in the year, his species must destroy more of these insects than almost all other birds put together. Nothwithstanding all this because the Robin occasionally treats itself to a few strawberries or cherries or grapes by way of desert, it has been proscribed in some places by the fruit growers, who have had influence enough to persuade our local legislature to take it out of the list of insectivorous birds protected by law, and allow, in the words of the act, "Any person during the fruit season to shoot and destroy the Birds known as the Robin and the Cherry Bird." It is scarcely fair to the Robin to put it in such company, though even the Cherry Bird, with all its fondness for fruit, assists in ridding our fruit trees of a host of insect enemies which infest them. In the case of the Robin, however, I have repeatedly, again and again, watched it while feeding its young—earth-worms, grubs, vine-worms, caterpillars and other insect food were being brought all day long, and on these the young birds were fed exclusively, and when it is borne in mind that the Robin, as I have already stated, not unfrequently raises three broods in the year, their services in the destruction of insect pests must more than pay three times over for all the fruit they devour.

Quickly following upon the arrival of the Robins comes the Blue Bird *(Sialia Sialis)*. Not so bold and fearless as the Robin, it does not come about our dwellings and grounds in quite the same familiar way; nevertheless, it is a sociable, gentle bird, and if unmolested will build and rear its young in the same spot, under the eaves of some out-building, or in a deserted Martin's box or even a knothole in a fence post.

For several years when the large rustic pavilion was standing in the centre of the Horticultural Society's Gardens the Blue Birds used to build regularly every season among the rafters of the roof, and their soft warbling notes could be heard all through the summer as, perched on the ridge, they dressed and plumed their feathers after returning from the capture of some moth or grasshopper or other insect prey.

Sometimes in the last days of March, though generally not until the 3rd, 6th or 7th of April, comes an old friend, familiar to most of us from boyhood, the Pee-wee, Fly-Catcher, *Sayornis Fusca*. Although it has but the one plaintive note, *pee-wee*, sometimes long-drawn out, and then changing into a little tremulous, murmuring twitter, as flying down from its perch on the housetop, or the gable of some old barn, it snaps up a passing insect, yet few sounds of bird voices are pleasanter to the lover of nature, for it is suggestive of warmth and sunshine, the waking up of insect life and all the gladness and freshness of spring. What should render this Fly-Catcher a special favourite with us is the tameness and familiarity with which it harbours about our dwellings, and its attachment to the same spot wherein to build its nest year after year; it may be under the eaves of the barn or stable, or, as if boldly claiming our protection, it will attach its fabric of mud and moss, and fine grasses, to some convenient ledge under the roof of our verandahs, where its proceedings may be watched day by day by all the inmates of the house.

By the 5th or 10th of April the Tree Sparrow, *Spizella Monticola*, and the Chipping Sparrow, *Spizella Domestica*, have made their appearance. The latter well merits its epithet of Domestica, for it is one of the tamest and most sociable of our feathered friends, and under the name of "grey bird" is known to almost every child in the country. No sweeter song is heard at this season of the year than the warbling of that handsome bird, the Purple Finch, *Carpodacus Purpureus*, which, although it may occasionally be seen in a very mild winter in company with the Siskin, or Crossbills, yet is a sufficiently rare winter bird to make its advent the more marked when April comes, and we catch sight of the handsome cock-bird on some bright morning in his full livery of shaded crimson, perched on the topmost bough of an apple tree, and pouring forth a succession of sweet, warbling notes, sometimes for half an hour together. Like the Pine Grosbeak, the Purple Finch occasionally commits great depredations on the buds of our fruit trees; and later in the season, when the cherries are ripe, it rivals the Waxen Chatterer in its devotion to that fruit. The plumage of the adult male is very handsome: The head, neck, breast, back, and upper tail coverts are a rich, deep lake, approaching to purplish crimson on the head and neck, and fading into rose colour on the belly. The quills and larger wing coverts are deep brown, edged with purplish red; and the tail feathers are deep brown, similarly margined.

That curious bird, the Towee Bunting, or Ground Robin, as it is sometimes called, *Pipilo Erythrophthalmus*, reaches us early in April. I have generally found it in clearings on sandy tracts, such as the Humber plains, partly overgrown with scrub oak and pine, where, among the withered leaves and underbrush, it passes much of its time searching for worms, the larva of different insects and uttering the peculiar note of Towee-towee.

As the power of the sun becomes sensibly felt, and in spite of cold winds and an occasional night's frost, there is an increasing mildness and softness in the atmosphere, and on some bright morning we unexpectedly hear a cheery twittering note above our heads, the Swallows have come! and despite of the old adage, we are ready to welcome the arrival of these harbingers of summer as a sure pledge that all frost and cold are over, and warmth and sunshine will now be ours.

The first to make their appearance of the swallow tribe are the White-bellied Swallow, *Irodoprocne Bicolor*, and the Sand Martin, *Cotile Riparia*. They both arrive nearly at the same time, about the 9th or 10th of April, though I have the arrival of the White-bellied Swallow noted in my diary one year on the 30th of March.

The Barn Swallow, *Hirundo Erythrogastra Horreorum*, comes next, about 15th of April. The purple Martin, *Progne Subis*, and the Swift or Chimney Swallow, *Chetura Pelasgica*, are generally the last to arrive, about the 20th of April, sometimes not until the very end of the month, though again I have the Purple Martin down one year as reaching us on the 9th of April.

The Purple Martin is a bold, fearless bird, attacking even hawks and crows when they come in his way. Its flight unites in it, all the swiftness, ease, rapidity of turning and gracefulness of motion of its tribe. It is well known or used to be well known to all dwellers in town and country as the constant tenant of the numerous bird boxes, or swallow-houses which are erected, sometimes on the sign board of the Village Inn, or on some out-building in the farm yard, or even in the streets of the town. Of late years, however, I fear that the English Sparrow has to some extent ousted the Martin from its old quarters in the towns, for, though no match individually, the sparrows by their numbers and pertinacity so worry and disgust the bigger bird as ultimately to drive it away. A few years ago a pair of Martins occupied a two story bird house in the yard attached to the Canada Company's office. There were many battles at first between the Sparrows and the Martins, but at last they seemed to come to a compromise, and the Sparrows occupied one story and the Martins the other, and brought up their respective broods without further fighting. Since then, however, the Martins have never returned and I cannot help suspecting that the same results may have followed in other places, for the bird certainly seems to be less numerous than in former years.

The Blackbirds and Grakles now make their appearance, and the reedy borders of our ponds and marshes, and the neighbouring woods are filled with these noisy birds. The Cow Blackbird, *Molothrus ater*, arrives first. The Swamp Blackbird or Red Wing Blackbird, *Agelæus Phœniceus*, sometimes in the last days in March, but more frequently about the 9th or 10th of April, and the Grakle or Crow Blackbird a little later. Little parties of the Cow Blackbird may be seen on fine mornings visiting the pasture fields and lawns, running about the grass in search of insects larvæ and worms, and betaking themselves at nightfall, to roost among the tall reeds and sedges on the margin of some swamp or river. This bird like the Cuckoo of Europe follows the singular custom of not making a nest of its own, but deposits its eggs, one at a time, in the nest of some other bird, leaving them to the care of a foster parent. When the female is about to deposit her eggs, she moves about uneasily from tree to tree until she discovers a nest from which the rightful owner is absent at the moment, and then quietly drops in her egg and flies off. It never deposits more than one egg in the same nest, although it is probable it thus leaves several in different nests. The birds employed as foster parents are all smaller than the Cow Blackbird—the Chipping Sparrow, the Maryland Yellow Throat, and some of the smaller species of Fly Catcher are among those most favoured, the Chipping Sparrow perhaps most frequently with us. As the young blackbird grows up it is provided for by its foster parents with all the care and assiduity that would be displayed towards their own offspring, and long after it has left the nest it continues to be fed by its affectionate guardians.

Frequently where the Chipping Sparrow has been the foster mother I have seen the tiny little bird carefully placing some choice worm or dainty insect in the open mouth of its great clumsy fluttering nursling, nearly half as big again as itself, whose sooty brown colour, as well as its size, offered a curious contrast to the delicately marked plumage and pretty slender form of its foster mother.

The Marsh Blackbird is well known to all by the extremely handsome plumage of the male bird, and any visitor to the meadows or marshes in the neighborhood of the Humber or the Don must be familiar with the peculiar song, if song it can be called, of "quonk-a-ree," sometimes uttered by half a dozen birds at a time from early dawn to midnight.

The Crow Blackbird or Purple Grakle, *Quiscalus purpureus*, although its food consists at some seasons of larvæ, caterpillars, moths and beetles, is the most mischievous to the farmers' crops of all the blackbirds, and is a serious nuisance in some of the localities in which they abound.

About the 10th or 15th of April, sometimes a few days earlier, if the season is favourable, the Grass Finch or Bay-winged Bunting, *Poœcetes Gramineus*, arrives, and soon makes its presence known by its deliciously sweet song, which may be heard all through this and the next month in our fields and open pastures and the borders of our woods, from "morn till dewy eve," being like the robin fond of pouring out a last farewell to the closing day. Its neatly built nest placed usually under a tussock of grass, constructed of fine grasses and roots bent and twined together, and the whole lined with hair-like roots and grass, may be met with in the open pastures or fields, sometimes as early as the end of April or the first week in May.

As the month advances fresh notes from new arrivals continually strike upon the ear. Strolling through the garden or the orchard we may hear a low, sweet, soft call-note like that of a tame Canary, followed immediately by a rapid joyous warbling, it is the American Gold Finch, *Astragalinus tristis.* This pretty, elegant, little creature, like the Purple Finch, sometimes, though rarely, lingers with us through a very mild winter, but generally they move off in large flocks to the south at the approach of autumn and do not return to us until towards the middle or end of April. The cock bird when in full plumage is one of the handsomest of our songsters, and unlike many others of our more gaily plumaged birds sings with great sweetness.

As April draws to a close and we pass into May, if the weather be warm and genial, not only the woods but our gardens and shrubberies are suddenly full of a host of charming little visitors, most of whom tarry for a very brief space disappearing again in a week or two, journeying on towards their northern breeding places. I allude to that large family the *Sylvicolidae* or "Warblers." some of which remain with us all through the summer, but large numbers of them merely pass through on their way northward in spring, and again on their return journey to the south in autumn.

Among the latter I may refer to a few which I have observed both in this neighbourhood and in the woods about Lake Simcoe. The Black Throated Green Warbler, *Dendrœca Virens*, and the Yellow Rumped or Golden Crowned Warbler, *Dendrœca Coronata*, are two most frequently seen and both remarkable for the beauty of their plumage, though in this latter respect, that lovely little bird the Blackburnian Warbler, *Dendrœca Blackburniæ*, surpasses them all.

The pretty little Blue-Yellow backed warbler, *Parula Americana*, is said to breed in Canada, probably in the more northern parts of Ontario and Quebec, but I have never met with its nest, nor do I remember ever seeing it during the summer months. Two species, the Canadian Fly-Catching Warbler, *Myœodivetes Canadensis*, and the Black and White Creeping Warbler, *Minotilla Varia*, frequently breed in our northern woods. Of those who take up their abode with us for the summer the best known and most familiar to most of us from its short but sweet and cheery song and its social confiding disposition is the Yellow Warbler, *Dendrœca Aestiva.*

It has little fear of man allowing itself to be approached quite closely, but during the breeding season the little bird shows great anxiety for the protection of its eggs or young, flying in front of the prying visitor or tumbling along the ground as if wounded after the manner of the partridge with wings and tail outspread, it endeavours by every artifice to attract the unwelcome intruder from the neighbourhood.

It is one of those birds occasionally selected by the Crow Bunting as a foster mother for its young, and not unfrequently the single egg of the latter may be found deposited among the five or six eggs of the Warbler.

Of all our summer visitors the most brilliant in plumage, almost tropical in its character is the Scarlet Tanager, *Pyranga Rubra*, which arrives from the south from the 10th to the 15th of May. The male bird is too well known to require description, but it may not be generally known that the female has none of the gorgeous colouring of the cock bird, but is olive green above and yellowish beneath, wings and tail brown, edged with olive colour, and the young males for the first season are colored like the females, but generally exhibit more or less of red feathers among the greenish ones. I have met with the nest and young of this handsome bird in the woods about Lake Simcoe, but only occasionally, and as a general rule they seem to disappear from this part of Ontario like so many of their companions, the Warblers, after a very brief stay in the early part of May.

Following close upon the arrival of the Scarlet Tanager, and often seen with it, comes that beautiful bird, the Crimson-breasted Grosbeak, *Zamelodia Ludoviciana*. In general it is a shy bird, keeping much in the forest, where it feeds mostly upon the seeds ef the birch and alder, the tender buds and blossoms of the trees, and upon insects which it catches on the wing ; but when the cherries are ripe in the gardens and orchards, it often approaches our dwellings, and certainly repays us for the little fruit it consumes by the delicious softness and melody of its notes. They are very numerous in the woods at Lake Simcoe, breeding there, and remaining with us until the middle of September.

Yet another visitor, whose gorgeous plumage quickly attracts attention to its arrival following the Tanagers and Grosbeaks, is the beautiful Baltimore Oriole, *Icterus Galbula*. Gliding from branch to branch in search of insects, the brilliant livery of the male renders him a conspicuous object, even if his clear, mellow whistling notes, which may be heard at a long distance, did not attract attention. In the woods, the Oriole generally builds in some tall elm or gigantic button-wood tree; but their singular nests are occasionally found in our orchards, suspended from the extremities of the branches of the apple or the pear. The nest is woven, as you all probably know, in the shape of a purse or bag, and is generally attached to two or more forked twigs by threads of the silk weed, or fibres of other wild plants, and not unfrequently when they can obtain them by pieces of string or thread, which the bird picks up near the neighbouring houses. With the same materials mixed with hair, wool or tow, it interweaves a warm and substantial fabric of nearly six or seven inches in depth, the bottom part being lined with horse hair.

The White Browed Crown Sparrow, *Zonotrichia Leucophrys*, and the White Throated Crown Sparrow, *Zonotrichia Albicollis*, both arrive in May. The singularly sweet notes of the latter bird must be well known to all observers. I have observed that they are generally most musical immediately before rain or during the frequent showers of the early part of the season.

Any one strolling through the meadows or near the margin of some stream or reedy pond during the latter part of May, will often hear an outburst of the most curious, jingling, joyous, laughable medley of a song that any bird throat ever uttered, and if he catches sight of the singer he will see it nodding its head, quivering its wings and with open mouth rattling out its curious notes as if its very life depended on it; this is the Bobolink Reed Bird or Rice Bunting, *Dolichonyx Oryzivorus*. Its plumage is almost as curious as its song, a mixture of black, white and yellow, disposed in a sort of piebald fashion over the body.

Much about the same period of the month a very different song may be heard, no one who has listened to it as from the topmost twig of some tall oak on some fine May morning, the singer pours forth its sweet cadences so full of melody, but will forever scout the assertion so often made by those who know little of our Canadian birds that they are destitute of song. It is the Ferruginous Thrush or Brown Thrasher as it is sometimes called *Harporynchus Rufus*, that is filling the air with melody, and in my judgment, except the Skylark and Nightingale of Europe, there are few birds whose vocal powers can compare with this thrush. If we desire a strong contrast we can have it in the harsh cry of another summer visitor often seen with the Thrush and other fruit loving birds in our gardens later in the year—the Cat Bird, *Mimus Carolinensis* Its curious harsh mewing like a cat, which it utters when alarmed, has earned for it the specific name of Felivox from some authors, which is certainly much more appropriate than *Carolinensis.* Nevertheless the Cat Bird is possessed of vocal powers which entitle it almost to be called the Canadian Mocking bird, for I have heard it imitate the notes of the Thrush and a host of other birds, and it will sometimes pour forth its "mocking" song until long after the sun has gone down.

Before the end of May the Wood Thrush, *Turdus Mustelinus,* and Wilson's Thrush, (Veery) *Turdus Fuscescens,* have arrived and their song may be heard in the woods at break of day and the last thing towards evening; and in the fields the sweet notes of the Meadow Lark, *Sturnella Magna,* are now mingled with the voices of the Song Sparrow and Baywing.

That bold and handsome bird the King Bird, *Tyrannus Carolinensis,* may be seen perched on some fence post, or outbuilding, or tall tree, ready to give battle to birds twice his own size, and especially to the Crow, to which he seems to have a special dislike. The various species of Fly Catcher, which come to us in summer, have now all arrived, and the Wood Pecker tribe, Golden wing and scarlet headed and others, are to be met everywhere as you pass through the fields and woods; but I must not go on with my catalogue any further, for I have already exceeded my proper limits in this paper, and I shall conclude with noticing a bird that may not be so familiar to many of you, which is always associated with the glowing heat of summer, when except in the early freshness of the morning the songsters of the grove are comparatively silent. It is then that from the deep shade of the woods, or from some cool thicket near our gardens, even during the hottest hours of the day, comes the soft but monotonous Coo-coo of the *Coccygus Americanus,* the yellow billed Cuckoo. It and the black billed Cuckoo, *Coccygus Erythrophthalmus,* which is very similar in its habits, though the latter is, perhaps, not quite such a shy bird as the yellow billed, frequents our woods all through the summer, and unlike the European bird, show much care and affection in bringing up their young, although their nest is rather a careless fabric, being composed of a few dry twigs, mixed with weeds and grass, and with so little concavity as sometimes to endanger the safety of its young.

I have thus only just faintly outlined, as it were, some of the "ornithological characteristics" of a *part* of the year. The details, if properly filled in, would occupy far too much of your time on the present occasion, even if I confined myself to the birds arriving in the spring and early summer. I must, therefore, defer any further notices of our "migrants" to another opportunity.

The paper was illustrated by specimens.

Remarks on some of the birds referred to were made by Messrs. Murray, Vandersmissen, Keys, Squier, McKenzie, Livingstone, Bain, Brodie, and Dr. Scadding.

ELEVENTH ORDINARY MEETING.

The Eleventh Ordinary Meeting of the Session 1884-'85, was held on Saturday, January, 24th, 1885, the President in the Chair.

The minutes of last meeting were read and confirmed.

The Hon. G. W. Ross, Minister of Education, and David B. Dick, Esq., Architect, were elected members of the Institute.

Tbe following list of donations and exchanges was read :

1. Monthly Weather Review, Dominion of Canada, for December, 1884.
2. Science, Vol V., No. 102, January 16th, 1885.
3. The American Journal of Science, for 1884, Vols. XXVII. and XXVIII.
4. Report of the Observatory of Yale College for 1883-'84.
5. Transactions of the Manchester Geological Society, Vol. XVIII., Part III., Session 1884-'85.
6. Proceedings of the Royal Geographical Society, N.S., Vol. VII., No. 1, for January, 1885.
7. Quaritch's Catalogue of Spanish Literature, No. 361.
8. Proceedings of the London Mathematical Society, Nos. 195 to 230, forming Vol. XIV. and part of XV.

   List of Members of the London Mathematical Society, November 13th, 1884.
9. Mémoires et Compte Rendu des Travaux de la Société des Ingénieurs Civils, 4 e Série, 37 e Aunée, 10 e Cahiér, October, 1884.

Donation of $50 to the Funds of the Institute, by Sandford Fleming, Esq., C. M. G.

On motion of Dr. Kennedy, seconded by Mr. George Murray, it was resolved that the thanks of the Institute be tendered to Mr. Sandford Fleming, C. M. G., for his generous donation.

D. A. O'Sullivan, M.A., LL.B., read a paper entitled

SYSTEMATIC CHARITY.

Every large city in the world has a destitute population ranging probably about five per cent. of the whole number of its inhabitants. There are the poor who are unable to work, the poor who are unwilling to work, and the poor without work for them to do.

The first of these classes include the sick, the aged, the deformed, and those who, whatever their disposition may be, are unfit to support themselves. They form the great mass of any city's permanent poor, and they are the ones towards whom the energies of the charitable and the actions of the Legislature are directed.

The second—and an alarmingly increasing class — furnish the pauper and the tramp of modern civilization, and it is said on the authority of a very experienced writer that "the pauper, the imposter, and the fraud of every description carry off at least one-half of all charity, public and private, and hence there is a constant and deplorable waste in the alms-funds of every large city."

The third class of poor, able and willing to work, but without work to do, is a fluctuating class, absent in one city and present in another, and varying also in seasons in the same city. They form the lower order of working classes; if work is provided for them they may arrive at a higher level, if not they become depauperized and are the scandal of society.

I have divided the poor whom the taxpayer and the charitable have to support into three classes, with reference to their capacity or inclination for work—for labor of some kind; but there are others with whom the public are concerned, such as the criminal of minor offences, who is kept in gaol or in prison at the public expense; the drunkard, who finds his way to the same institutions, and a large miscellaneous class who, by reason of vice that is a legal crime, or vice that may not be such, are maintained in the hospitals and infirmaries and magdalen asylums, and whose children are to be found in the various institutions from the infants' and children's homes till they are ripe for a repetition of the vices and career of their parents.

The social and economic problems in regard to the poor are neither few nor simple of solution. What is to be done for the honest poor who desire to better their condition? and what remedies can be offered to repress the degrading process by which a poor man becomes a pauper? How, in fact, can the worthy poor be enabled to help themselves, and how can the pauper and the tramp be exterminated? The task of maintaining the helpless is a very small one compared with the tax to maintain the idle and the undeserving. The ratepayer and the charitable have to support not only themselves but the poor and destitute of every kind, and it is important to them to aid in any effort towards the co-operation and efficiency of our charities.

Charity comes to be administered within a score or so of institutions in cities like Toronto, and so far as indoor relief or assistance is concerned there is not so great a necessity for any organized co-operation. The waste and abuse and imposture is chiefly in regard to outdoor relief, and it is all the more in those cities where no well organized association of charities exist. It is of this organization of alms-giving that I propose to treat principally in this paper.

Within the last seven years 36 charity organizations have sprung up in the United States, and it is on the experience of the workings of these institutions that I propose to direct your attention. I have preferred relying upon the reports of charities in those cities having so many features in common with our own, and so have not gone into the workings of any other foreign charities. The *Monthly Register*, of Philadelphia, collects information from all quarters, and is the official journal for a large number of charity organizations. It is obvious that wherever a Poor Law system prevails there would be fewer materials for our guidance in organizations than where no legislation is required for their efficient working.

The principles upon which American charity organizations are founded are very simple and very well understood.

A charity organization does not mean one mere charitable society. "It means," in the language of Mr. Kellogg, the organizing Secretary of the Associated Charities of New York City, "an alliance offensive for economy, thoroughness and efficiency of all such organizations of public official relief, and of congregational and individual beneficence, into one harmonious and co-operative body, maintaining intercourse and comparison through one central agency, and pledged to united and concurrent efforts for the suppression of the pauper and the rescue of the deserving poor."

It means a common field in which men of all beliefs and men of no belief can work side by side in the cause of humanity. It means an examination into the cases of individual destitution by a personal canvas, and it means a thorough investigation of every applicant, so as to detect and expose imposture, and is, therefore, a comparison and exchange of information in confidence.

This central agency or bureau does not interfere in any way with the workings of the existing charities. It gives no relief except in rare, urgent cases. It excludes no worthy applicant, and it frowns down any attempt at proselytism. It aims to prevent imposture, to reduce vagrancy and pauperism, to relieve the destitute, and to give relief in return for employment. It has its agencies, its branch offices, its paid and volunteer officers, and as efficient a system of registration as possible.

This last—a registration of the names of all in the city in receipt of private or official relief—is not only one of the first things insisted upon, but it will be noticed in comparing the reports foı different years that it is considered of very increasing importance. The report from Baltimore (and I quote the latest issued) says that the charity directory has already proved of valuable assistance. In Brooklyn, Boston, Detroit, and many other cities, a map is prepared, the names of applicants collected as far as possible, and a list of those obtaining relief from the circle of charities in the city.

The manner in which this was done in Buffalo is a fair example of what can be done with little expense. "Circulars were sent to all church societies, relief societies, benevolent societies and fraternities, and to all asylums and hospitals, asking for particulars as to their mode of operation, the kind of relief given, &c. Then the books of the Poor-master's office were copied, and shortly after, through the kindness of the Superintendent of Police, blanks were delivered at every house in the city by the police, asking for full particulars of any relief that any citizen was giving at that time to any poor person or pensioner. These forms were collected by the police twenty-four hours after delivery, and out of some 30,000 issued, some 3,000 were returned filled in." "And this," says the very able writer on the subject of Charity Organization, the Rev. Mr. Gurteen, "our first work of registering the names of all in the city in receipt of relief, whether official or private, was begun." Books were then opened for indoor and outdoor relief, and classified as public or private, and the information methodically arranged, with the names in alphabetical order. It was found that the same person, in some cases, was in receipt of relief from three or four different societies, from a dozen different individuals, and from one or more churches, besides being on the poor books. "It was a lesson," he adds, "Buffalo will never forget."

The Secretary of the Brooklyn Bureau of Charities says: "The value of the registry system is now proved by actual test in the principal cities of the country. The system in some form is indispensable to the intelligent administration of charity." * * * "A complete registry is the only adequate check upon those who subsist upon alms fraudulently obtained."

"In New York," Mr. Kellogg says, "we should feel ourselves powerless without it, and the bulk of the large relief societies would feel that its abandonment was a long step backward." There are 195,000 persons in the New York Registers.

One reason why this is insisted upon—and a number of other authorities could be cited—is that it corrects abuses in the outdoor relief. The tendency of outdoor relief, it is said, is demoralizing. Detroit officially reports in favour of its abolition. Brooklyn and Philadelphia have made it illegal. New York gives no outdoor relief, except to the adult blind. Buffalo has taken the same view, and great savings are reported in cities where the organizations are complete, or where outdoor relief is entirely abolished, as in Brooklyn and Philadelphia. To reduce imposture is to reduce vagrancy, and in this knowledge is really power. To know that one person is deserving and another is not, is not only to be in the way of effectual alms-giving, but it is a saving of expense and an encouragement to the relieved.

On all points of view every aim of methodical charity is assisted, strengthened and sustained for good by the completeness of its registration; registration of those who ought to be relieved, whether they ask it or not, and registration of those who ought not, no matter how or where they apply for relief.

The other features of the American, or as it might be called, "The Buffalo Plan" of Organizing Charities, do not need especial mention. No good would be done by attempting to interfere with the existing charities, and every one would deprecate any attempt at proselytism. Charity, in this human aspect of it, as well as on the Divine side, should exclude no person, or body of persons, on account of religious creed, politics or nationality. Such an organization requires but little funds, as the rule is to give no alms. If it can direct where alms should be given and where withheld, a great good will have been accomplished. Its funds are intended to be used solely in payment of such paid officials as may be necessary. In Boston, with a population of about half a million, the expenses of the associated charities are in the neighbourhood of $13,000, but they have 25,000 people on their books, and received reports from 47 charitable societies and 571 private individuals, and employ about 600 paid agents. Last year the central office received over 30,000 reports, and sent out about half that number. In Philadelphia, with a larger population, about 1,000 or over are employed, and the expenses are very much less, only about $4,000. In Buffalo the expenses of the first year were $6,700, and it is claimed that there was a saving to the ratepayers in that year of the sum of $48,000.

The task of seeing that all deserving cases of destitution are properly relieved is, of course, one of the greatest aims of these associated charities. This is effected by a network of agencies throughout the city, at the headquarters of which the chief officer has a list of charities and a report of the person to be relieved. The visitors make a recommendation to the proper charity in order to obtain relief. This is not a thing to be done in a day or a year, and I notice that while the early reports recommend that all officers of the organizations be paid—that there be no sentiment but all business in the matter—some of them now admit that to have been an error; that volunteer charity is, when it can be got, the right sort of charity. This would not, however, apply to the central office, which is open all day, and where a complete register of every case of relief is to be had. In communication with this central office, and revolving around it, as it were, are the district committees, and with these the use of volunteers is not only desirable but imperative. The work could not be carried on otherwise. The usual support given to the poor, the encouragement to elevate their home life, their health, and their habits are matters for the benevolent citizen who can snatch a half hour in the week for that purpose, and comes all the better from him than from the official representative of charity.

Indeed the associated charities must do good in this direction, or do very little at all, as they are not organized to relieve the poor by giving alms, but to enquire into the cases of deserving poor and thus aid the existing charities, and secondly, to help the poor to help themselves. So long as real misery exists or is skilfully counterfeited, so long will the charitable hand out their money on the street or in their offices, no matter how many charities there may be around them. The association of charities is opposed to this thoughtless or indiscriminate giving. An English clergyman, speaking of his experience in the terrible winter of 1867-'8 in the east end of London, says that out of every shilling ticket he had given he had done four pennyworth of good to eight pennyworth of harm—the 4*d.* representing the bread which had gone into the mouths of a wretched population, the 8*d.* the premium which was given to their wasteful, indolent habits. Immediately after the experience of these times a society was started in London called the "Charity Organization Society," and it gives no relief (except in the extreme cases of despair or imminent death) without previous and searching examination. At its head is the Bishop of London; and men like Cardinal Manning. Mr. Gladstone, Mr. Ruskin, the Earl of Shaftesbury and the Duke of Norfolk are amongst its officers.

One of the aims of a charity organization calls for special mention. The basis of relief is employment in all cases where work can be got, and where the applicant is able to work. This is easier to discuss in theory than to reduce to practice. One thing has, however, been noticed. Whenever work was obtainable the applications for relief fell off. In many cities the procuring of work is put on a commercial basis as they say; in many the civic authorities provide employment. In Baltimore it is made a substantive charity called the Provident Wood Yard. When a man professed a willingness to work and work could not be provided, it was cruel to dismiss him as undeserving. Any man making a proper application is provided with living wages until something better can be found for him.

Tickets for this purpose are with the charitable societies and the police. When the managers of a Boston charity attached thereto a wood yard, and announced that relief would be given to no able-bodied man unless willing to do a certain amount of work, the daily number of applicants fell off at once from 160 to 49, and Mr. Gurteen adds that in every city in which the test has been applied it has been eminently successful. In Philadelphia, when an able-bodied mendicant after an offer of such a ticket refuses to send to the office for relief, the police are called upon to arrest him.

As evidences of the assistance given to the public and to the existing charities, it is reported that in Buffalo, for example, street begging is effectually done away with. In another American city the assistance given towards repressing imposture is officially stated at a decrease of 58 per cent. in the number of vagrants and 73 per cent. in the number of undeserving poor.

Even on the low ground—but one not to be forgotten—of a pecuniary saving, very complimentary figures could be given. In London in ten years the cost of maintaining the poor has been reduced 30 per cent., and in some of the American cities to more than double that proportion.

These associated charities advise the public to give no money to any applicant, but to send the applicant to their central office, where his case will be considered and attended to. If he can work and if he refuse to work, he gets nothing; and it requires no comment to shew that private charity is almost always unable to detect this unwillingness. The money given to such a person is worse than thrown away. It is an encouragement to pauperism. It is not an agreeable task for the charitably disposed to encounter these applicants and to be never absolutely certain that their offering is not squandered on the most worthless of characters. The organized charities say, We can manage these things better, and what is a trespass on your time is our employment and duty.

These charitable organizations say, in the second place: visit the poor, give your information, your assistance, to find out and detect fraud, and to ascertain who are really deserving of relief, but give your money to the existing charities. The lame and the cripple, not to speak of the man with the seven helpless children, and no fire in the house for days, are frequently found to have amassed great sums of money by begging. And this art is so profitable that it seems to be worth acquiring. An advertisement is said to have appeared in a London paper, where the art of begging is taught exhaustively in six lessons by a person who has founded a college for that purpose. He had an assortment of professional appliances, artificial wounds, trained dogs for the blind, crutches, and could direct his students to the most lucrative streets and neighbourhoods.

Whilst the existing charitable institutions and societies are not at all interfered with by these organizations, they are assisted and protected by them. It has been said that a knowing tramp in this city of Toronto, with its churches and its two dozen of charitable institutions, could put in the winter very well, and if detected too early, could easily earn the sixty days that would entitle him to free quarters in the gaol. The church societies are largely imposed upon also, and in the many cases of slender stipends of the clergymen the imposition is outrageous. The charity of all is much greater than the good done to the recipients of it, and whilst an association, such as we have been describing, may not remedy everything, it might do a vast deal of good.

Mr. Dale stated a case that came under his observation at Newport.

Mr. Hughes approved the idea of registration of paupers.

Mr. Murray thought we had in the Combined Charities the nucleus of what is wanted, and suggested that the children of confirmed paupers should be taken charge of by the State, but that the moral reformation of the parents should be left with the church.

Mr. Vandersmissen referred to the difficulty of the State assuming the care of children of criminals undergoing punishment.

Mr. Phipps said that pauperism might be reduced one-half by stopping immigration of unsuitable persons.

Mr. Livingstone and Mr. Elvins made some remarks.

TWELFTH ORDINARY MEETING.

The Twelfth Ordinary Meeting of the Session 1884-'85, was held on Saturday, January 31st, 1885, the President in the Chair.

The minutes of last meeting were read and confirmed.

W. Boultbee, Esq., C. E., was elected a member of the Institute.

The following list of donations and exchanges was read :

1. Report on the Necessity of Preserving and Replanting Forests, by R. W. Phipps, Esq.
2. Monthly Health Bulletins of Ontario, for October and November, 1884.
3. Science, Vol. V., No. 103, January 23rd, 1885.
4. Report of the Superintendent of the United States Coast and Geodetic Survey, for the year ending with June, 1883.
5. Bulletin of the Essex Institute, Vol. 16, Nos. 7-12, July to December, 1884.
6. Papers on Time-Reckoning, and the Selection of a Prime Meridian, by Sandford Fleming, C.M.G.

Mr. R. W. Phipps read a paper on

FORESTRY, AND THE NECESSITY FOR ITS PRACTICE IN ONTARIO.

I must beg the attention of my hearers for a short space to a subject which is not uninteresting, and is very important—the rapid and injurious deforesting of Ontario and the means whereby it can best be checked. When, not so long since, the white men came first hither, the forest wealth of all this region was immense. Could it have stood till now there would have been no difficulty in rapidly selling timber enough to build half-a-dozen Pacific Railways had we so chosen to invest our funds. But the settlers came; they needed sustenance ; they could not eat the trees ; they could not sell them, and they burned them. But unfortunately, much was uselessly burned. Much land so cleared had far better have remained uncleared until to-day. I have seen near Toronto great heaps of clear pine, worth now $40 a thousand, burned to uncover poor land which gave but a crop or two, and ever since but very poor pasture. I have seen out west where great fields had been in walnut, two or three trees, left by accident, had sold for a thousand dollars, showing that the field would have sold for a hundred thousand dollars—a field which, in its whole cleared day till now has never given a thousand profit. Much land through the Province might well have been spared the axe and yet enough been given to the field. But we cleared without method or order, each thinking the more he cleared the richer he grew, till a deadly hatred of trees seems to have pervaded the community, and their destruction was considered equally patriotic and beneficial. It is found, however that we have been under a great mistake, and that a country will grow more grain and cattle and produce them easier when one-fourth is left in woods interspersing the rest than when all is cleared. The reason of this is evident to all who consider the structure of a tree, which I will ask you to notice. Every tree draws its nourishment from the soil near its roots. It is carried upward by means of a large quantity of water, which passes with it to the leaves—the lungs of the tree. Here it is exposed to the air, changes occur, the food goes to its place in trunk, branch, or leaf, the water passes off into the air. It is said one oak may thus send off 440 gallons per day. At all events the amount transpired by a tree is large—that of a forest immense. This passes upward to the atmosphere—it is said that if it could be tinted the wood below would form no proportion in size to the vast coloured columns above—and being cool, necessarily compels precipitation on reaching a warmer stratum of moist air, and rain ensues as soon as the precipitation is sufficient. The forest is the great local cause of the showers which fertilize the spring and summer fields. The next great benefit to agriculture is the reservoir they form for water. Their bed is deep, loose, porous, a mass of decayed leaves, intersecting roots, and forest soil, which holds in reserve great quantities of water (which otherwise would flow rapidly off over the fields), and feeds therewith the innumerable underground channels which keep moisture in the soil. Once we got water by digging seven or eight feet in many places ; now we must go forty or fifty. As land is too much cleared the springs recede from the surface, and the process goes on, where allowed, till it becomes a desert where no blade of grass can grow. In history countries are known to have been rich and fruitful, to have been deprived of their due amount of trees ; to have become sterile and be abandoned by their population ; to have been sufficiently replanted, to have recovered their lost watercourses and their vanished rainfall, and to have become fertile again. (Mr. Phipps gave many instances from the history of different lands—Spain, France, Germany, Palestine, India, and others bearing on this point.) The operations of nature, he said, are chiefly hidden from our view. We see the tree grow and the field yield its increase, but the actual accretion, particle by particle, so that the buds sprang forth, the leaves appeared, the blossom and the fruit followed in due season, is not within our sight. But we know that the sun gave its warming beams; that the moisture continually rose from the earth at its call, and fell again in rain, and rose and fell again. And we know that when alternate heat has dried the land, and alternate shower has given its waters, till trunk and branches drip, and the roadside ditch is a flowing river, that then leaf and bud and blossom glow and swell with a newer beauty, that the great leaves of the cornfield broaden with a more vivid green, that the waving wheat receives growing impetus and overtops the rustic fence, and every embowering grove sends out a fresher fragrance upon the summer air. It is the enriching influence of the circulation of heat and moisture—it is with this we interfere when we deforest the land. In Ontario, in many parts, we have cleared all but ten per cent, and even this small amount is not remaining. How to preserve and increase it is the chief question for Ontario to-day, for on that alone depends whether her farms shall remain fertile or become barren. In the rest of the address, which was entirely impromptu, and of which this report is necessarily but a synopsis, Mr. Phipps narrated many interesting facts concerning the influence of deforesting on agriculture in Ontario, and stated that, in the older settled parts, there were but three ways of proceeding. By windbreak, by plantation, and by preserving whatever portions of forest yet stood, by excluding cattle, which last was the main point. He gave the methods of proceeding in each case, and mentioned the trees suitable for each. He also spoke of the large pine forests in the interior, the necessity of their preservation from fire, described the burnt lands he had lately seen near the Ottawa, where for a length of seventy miles, and a breath of twenty, in one place alone, was nothing but dead trees, useless now, a pine forest worth many millions a few years back, and mentioned that Quebec was reserving great areas for forest alone, discouraging settlement wherever the pine forest should be preserved. He concluded by saying that it was much more than a Provincial, it was more than a national, more than a moral question, it was an object which should be impressed upon us by the highest feelings of our religion. We found here the wood, the water, the fertile soil. We know that the deforesting of a country does more than remove the one, it greatly impairs the others, so that the land may not be able to support more than the tenth part it now maintains. We should remember that no proprietor can have a title to destroy the fertility of the soil, lest "the field cry out against him, and the furrows thereof likewise complain." The vast concourse of humanity continually emerges from the unknown past, it travels toilsomely by, it is lost in the clouds of the future. Be sure that there we shall meet with strict questioners; nor will those pass unchallenged who have, to serve their own purposes, rendered painful, sterile, and barren, the path of generations yet to follow.

Mr. Browning asked if the Government was taking any action in the direction suggested.

Mr. Phipps replied that several reports on the subject were made at the instance of the Government.

Mr. Macdougall spoke of Forestry Associations in the North-west, in Australia, and in India, whose work had produced beneficial results.

Mr. Murray considered the subject as one of great importance to this country, and suggested that cattle should not be allowed to pasture on forest land, as when they do so pasture they prevent second growth.

Mr. Bain and Mr. Livingstone made some remarks, and the President illustrated on the blackboard the difference between trees grown in the forest and in the open field.

THIRTEENTH ORDINARY MEETING.

The Thirteenth Ordinary Meeting of the Session 1884-'85, was held on Saturday, February 7th, 1885, the President in the Chair.

The minutes of last meeting were read and confirmed.

Neil McEachren, Esq., B. A., was elected a member of the Institute.

The following list of donations and exchanges was read:

1. The Canadian Practitioner, Vol. X., No. 2, for February, 1885.
2. Science, Vol. V., No. 104, for January 30th, 1885.
3. American Journal of Science for February, 1885.
4. Journal of the New York Microscopical Society, Vol. I., No. 1, for January, 1885.
5. Harvard University Bulletin, Vol. IV., No. 1, for January, 1885.
6. Transactions of the American Society of Civil Engineers for November, 1884.
7. Transactions of the Connecticut Academy of Arts and Sciences, Vol. VI., Part 1.
8. Verhandlungen der Berliner Gesellschaft für Anthropologie, Ethnologie und Urgeschichte, Sitzungen vom 17 Mar', vom 22 Jan., vom 19 Jul, 1884.
9. Correspondenz-Blatt der Deutschen Gesellschaft für Anthropologie, Ethnologie, und Urgeschichte, XV,, Jahrgang, No. 11 u 12, November und Dezember, 1884.

Mr. Ernest E. T. Seton read a paper on "The Ruminants of the North-West," in which a brief account was given of the following twelve Ruminants :—

1.	Common Virginian Deer	*Cervus virginianus.*
2.	Mule Deer or Jumping Deer	" *macrotis.*
3.	Woodland Caribou or Reindeer	" *tarandus.*
4.	Barren Ground Caribou	" *arcticus.*
5.	Elk or Wapiti	" *canadensis.*
6.	Moose	" *alces.*
7.	Antelope or Cabri	*Antilocapra americana.*
8.	Rocky Mountain Goat	*Magama montana.*
9.	Rocky Mountain Sheep or Bighorn.	*Ovis montana.*
10.	Musk Ox	*Ovibos moschatus.*
11.	Prairie Buffalo	*Bison americanus.*
12.	Wood Buffalo	" " *var ?*

Original observations on each of these were brought forward, together with many facts relative to their economic value and preservation of the species. The last named had never before been described by scientists, therefore Mr. Seton's account of it is given in full.

THE WOOD BUFFALO.

(*Bison americanus, var ?*)

The present is very closely related to the Prairie Buffalo. The majority of writers either hold them to be identical, or ignore this variety altogether; but this is owing chiefly to the lack of information regarding the animal, for, curiously enough, this the largest land mammal in America, is among those of which the very least is known.

The information which is here presented, is gathered from Captain Butler's narrative, and from the lips of two northern hunters, Elzear Mignault, who spent twelve years (1863-'75) on the Peace River, in the service of the Hudson's Bay Co., and Mr. K. N. L. Macdonald, a Winnipeg gentleman, who, for ten years, hunted on the upper Mackenzie. The accounts of the two latter agree in all important points, except that Mr. Macdonald considers the Wood Buffalo a mere variety of the prairie animal, while Mignault, whose experience is much greater, maintains, with the Indians, that it is distinct; urging also, in support of his opinion, that the last Prairie Buffalo ever seen in the valley, was killed in 1866. It was a solitary, mangy bull, a complete outcast, and this needed not to have been his condition had the Wood Buffaloes been his immediate kindred.

All my informants agree that the Wood Buffalo differs, chiefly, from its prairie relative in being much larger, and considerably darker in color. Mignault adds that its legs are proportionately *shorter*, its horns less robust and more curved inwards, its hair is shorter, finer, entirely without curl, and all over of a very dark brown—almost a black in winter,—but in summer assuming a hue similar to that of the prairie animal.

Capt. Butler, who traversed the Peace River valley in 1870, wrote as follows: "But, although, the Moose are still as numerous on Peace River as they were in days far removed from the present there is another animal which has almost wholly disappeared."

The giant form of the Wood Buffalo no longer darkens the steep, lofty shores. When first Mackenzie beheld the long reaches of the river, the "gentle lawns," which alternated with "abrupt precipices," were "enlivened" by vast herds of buffaloes. This was in 1793. Thirty-three years later, Sir George Simpson also ascended the river with his matchless Iroquois crew, yet no Buffalo darkened the lofty shores.

What destroyed them in that short interval? The answer is not difficult to seek—deep snow! The buffalo grazes on the grass, the moose browses on the tall willows. During one winter of exceptionally deep snow, eighty buffaloes were killed in a single day in the vicinity of Dunvegan. The Indians ran them into the snow-drifts, and then despatched them with knives.

It is still a matter of dispute whether the Wood Buffalo is the same species as his namesake of the southern plains; but, it is generally believed by the Indians that he is of a kindred race. He is, nevertheless, larger, darker and wilder; and, although the northern land in which he is still found abounds in open prairies and small plains, he, nevertheless, seeks in preference the thickest woods. Whether he be of the plain race or not, one thing is certain,—his habits vary much from his southern cousin. The range of the Wood Buffalo is much farther north than is generally believed. There are scattered herds, even now, on the banks of the Liard River, as far as sixty-one degrees of north latitude.

When Mignault left the Peace River in 1875, the Wood Buffalo were plentiful in the country between Dunvegan and Great Slave Lake, and the Liard and Arthabasca Rivers. In 1884, he heard from a comrade, that they were then still common.

The Indians, he said, call it *Ah-thuk-ard Moos-toosh*, and consider it quite distinct from the Prairie Buffalo, which they call *Mas-Kootay Moos-toosh.*

Its general habits differ a good deal from those of its prairie relative, rather resembling those of the Moose, although it is much less wary and difficult to approach than that animal.

It is rarely found in herds, except in the fall. The greatest number my informant ever saw together was three. These were going down to the river, as he rounded a point in a barge. As soon as he came in view, they scrambled up the bank and disappeared in the woods. But in the month of October, the mating season, they are inclined to gather into straggling bands of both sexes, and go roaming about the woods, which are made to resound continually with the thud and trampling of the males engaged in battle.

During the winter they confine themselves to the heaviest and densest timber, subsisting on willow scrub, moss, and such dry grass as is attainable. In the summer they are so much persecuted by the bull-dog flies, that they spend the greater part of warm days immersed to the eyes in some lake or mud hole, and it is not an uncommon sight for the voyageur, who silently rounds some point on the Liard, Salt or Peace River, to observe, protruding from the water, the great black head of the buffalo, who, gazing stupidly for an instant, then suddenly bestirring himself, plunges to the shore and disappears among the trees. They feed in the night, the only time they are free from the torment of the gad flies. They seek the thick swamps from preference, but distinguish and avoid the treacherous bogs or *muskegs*, which are found in various parts of the country.

My informant thinks that they frequent the dense woods in summer, chiefly to escape the persecutions of the gad-flies; for, when the day chances to be so cold and windy that not a fly is to be seen, they take advantage of the opportunity to climb about even the high, rocky hills.

The young are produced sometime in June, usually one, but occasionally two at a birth. Concerning their color, development and growth, I have not been able to procure reliable information.

There is one other general observation that I would make in connection with the buffalo. In a previous paper, I brought forward reasons for believing that, within a very recent period, this prairie country was one continuous forest, and that fire had been the clearing agent. Where, then, it may be asked, were the Prairie Buffaloes in those forest days? I am inclined to think there were none, but that the sole bovine inhabitant of the country was the Wood Buffalo, and that the prairie animal is a recent specialization, which conforms in its change of form and habits to several precedents, wherein a wood animal has become smaller, lighter colored, and gregarious, on betaking itself to a life in the open country. As examples, I may cite the almost solitary giant Ure Ox of Cæsar's time, said to be the ancestor of our common cattle; the Prairie Wolf, doubtless very nearly akin to his larger brother of the timber; and the Barren Ground Caribou, which evidently was but recently differentiated from its larger, darker, and less gregarious woodland brother!

So far, I have not had an opportunity of examining the hide of the Wood Buffalo, though I learn that they are not esteemed great rarities, even among Fort Garry furs, yet, I hope that any reader who may have the opportunity of measuring or describing this animal, or in any way adding to our knowledge of it, will not fail to avail himself of it, and thus render to Science most useful and valuable assistance.

Mr. Rouse suggested as a reason why the elks migrated to the north in winter the weakness of their horns, but this was doubted, because another species migrate the reverse way.

Mr. Notman asked what became of their cast-off horns, to which it was answered that they were eaten by small rodents.

Mr. Shaw asked the name of the Oat referred to. Ans.—*Stipa spartica.*

Mr. Murray asked as to the fertility of hybrid deer, to which it was answered that they were all fertile.

The President remarked that the only domesticated American animal was the Llama.

FOURTEENTH ORDINARY MEETING.

The Fourteenth Ordinary Meeting of the Session 1884-'85, was held on Saturday, February 14th, 1885, the President in the Chair.

The minutes of last meeting were read and confirmed.

The following list of donations and exchanges was read:

1. Rules and Regulations of the Royal Society of Canada.
2. The Canadian Entomologist, Vol. XVI., No. 12, December 1884.
3. Science, Vol. V., No. 105, February 6th, 1885.
4. Appleton's Literary Bulletin, Vol. IV., No. 1.
5. Journal of the Franklin Institute for February, 1885.
6. Monthly Notices of the Royal Astronomical Society, Vol. XLV., No. 2, for December, 1884.
7. Transactions of the Royal Scottish Society of Arts, Vol. XI., Part 2.
8. Atti della Società Toscana di Scienze Naturali, Processi Verbali, Vol. IV.
9. Boletin de la Academia Nacional de Ciencias in Cordoba (Republica Argentina), Tomo VI., Entrega 4*a*.

Mr. W. J. Loudon, B.A., read a paper on "The Decimal System applied to Time," of which the following is an abstract :

The system of Time which I propose is the following: The ordinary day of twenty-four hours would be divided into ten periods called, if necessary, hours ; each hour in the new system thus corresponding to two hours and twenty-four minutes of ordinary time. This new hour would be divided into one hundred divisions (which we may term minutes) : each of the latter minutes being equivalent, therefore, to 1·44 minutes of present time, and being a sufficiently good working unit. For small measurements, this minute could be subdivided into one hundred seconds, each of the new seconds corresponding to ·864 of the old.

The advantages which I claim for the adoption of such a system are :—

1. All advantages arising from the use of a system based on our natural scale of ten. Instead of using separate symbols to denote hours, minutes, seconds, time would be denoted by a number and a decimal : thus, instead of saying and writing 2 hrs., 25 min., 30 sec., we would simply say and write 1·45. The labour saved in addition, subtraction, etc., would be incalculable. As a corresponding example of labour saved, I need only refer to the English system of pounds, shillings, pence, and farthings, when contrasted with our decimal system of dollars and cents.

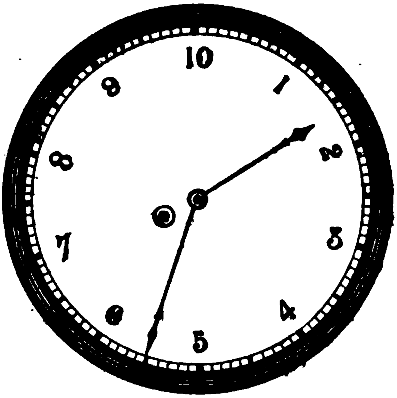
2. The abolition of the a.m. and p.m. nuisance. This has, of course, been overcome by the twenty-four hour scheme, but the latter is too unwieldy ever to come into common use.

3. The change in units, the hour becoming longer and the minute longer, than the present hour and minute.

4. The fact that the numbers on the face of the clock indicate the time at once. The greatest objection to our present system (if we omit the a.m. and p.m. distinction) is, that the time at any instant cannot be inferred by any simple process of the mind from the dial of the clock ; when the minute hand is at one, we say it is five minutes past ; when the minute hand is at eight, we say it is twenty minutes to ; when at eleven it is five minutes to, and so on. If we analyze the reasons for which children find so much difficulty in learning to tell time, we shall find the cause of all their trouble in

this strange arrangement of time measurement. Indeed, it is only after years of patient labour and mental struggle, that the majority of children succeed in fixing in their minds the meaning of the minute hand when in different places. Let anyone take the clock constructed in the manner I have indicated, and I will venture to say that any child can learn to tell the time from it in a few short lessons. I might go still further, and make the general statement that an enormous amount of mental labour is expended among ordinary people in looking at a clock or watch, and going through the struggle that is termed "telling the time."

The clock which I have constructed from an ordinary eight day clock, and which fulfils accurately the above conditions, as regards the hours and minutes, is represented in the Figure.



TIME 1·55.

Mr. Keys, referring to the clock on the decimal system by which the paper was illustrated, showed the ease with which the change could be made, viz., by the use of two additional wheels, and congratulated the Institute on the reading of this paper so soon after Sandford Fleming's, by which important changes were brought about.

Mr. Livingstone doubted whether the change could be made, because the human mind is not mathematical, but rather musical, running in 2's 3's and 4's.

The President approved of the change because we are committed to the decimal system of numeration, but thought it a misfortune that the duodecimal system had not been adopted in the first instance.

FIFTEENTH ORDINARY MEETING.

The Fifteenth Ordinary Meeting of the Session 1884-'85, was held on Saturday, February 21st, 1885, the President in the Chair.

The minutes of last meeting were read and confirmed.

The following list of donations and exchanges received since last meeting was read :

1. Monthly Weather Review, Dominion of Canada, for January, 1885.
2. Science, Vol. V., No. 106, February 13th, 1885.
3. Annual Report of the Board of Managers of the Buffalo Historical Society, January 13th, 1885.
4. Second Annual Report of the Board of Trustees of the Public Museum of the City of Milwaukee, October 1st, 1884.
5. Anthony's Photographic Bulletin, Vol XVI., No 1.
6. Proceedings of the Royal Geographical Society, Vol. VII., No. 2, February, 1885.
7. Notice Historique de l'Université de Bruxelles, 1834—1884, par L. Vanderkinden.
8. Bericht über die Senckenbergische Naturforschende Gesellschaft, vom Juni, 1883, bis Juni, 1884.
9. Fünfter Jahresbericht der Geographischen Gesellschaft zu Hannover, 1883-84.

Mr. Vandersmissen gave notice that at the next meeting of the Institute, he would move that a committee be appointed to consider in what way the work of the Institute could be carried on in sections.

Mr. Lennox read a paper on "The Fossil Sharks of the Devonian."

The subject of this paper was the fossil fin-spine of a shark, taken from the corniferous limestone, at St. Mary's, Ont. It belongs to the genus *Machæracanthus, Newberry.* This genus is distinguished from all other fossil fish-spines by not being bilaterally symmetrical. They have been found only in the corniferous of Ontario, New

York, and Ohio. The specimen in question, *M. sulcatus*, is ten and a-half inches in length, about an inch wide, and two-thirds of an inch deep. Its original length, however, may have been fourteen or fifteen inches. It is grooved longitudinally upon one side, smooth and keeled on the other.

Symmetrical spines like *Pleuracanthus* were, doubtless, implanted in the flesh, in front of the dorsal fins; but the asymmetrical forms were, in all probability, imbedded in the integuments, before the pectoral fins.

Judging from pieces of shagreen found with the spines, and the total absence of traces of a long skeleton, we may fairly conclude that these were the defensive weapons of very large sharks, which must have been formidable indeed.

Mr. Dale mentioned a spine somewhat similar, which he had found in marl, in New Jersey, and drew attention to the mode of attachment of the spines, by which they were held erect.

Mr. Boyle having asked as to the traces of shagreen in the rocks at St. Mary's, Mr. Lennox replied that they were found in patches, five or six inches square.

Mr. Livingstone suggested a theory that the carboniferous had something to do with the destruction of these fish, and that coal was the result of solidification of coal oil.

Mr. Macdougall, Mr. Notman, and Mr. Murray, made some remarks, and the President noted the great interest of a discovery of remains of sharks at so remote a period.

SIXTEENTH ORDINARY MEETING.

The Sixteenth Ordinary Meeting of the Session 1884-'85, was held on Saturday, February 28th, 1885, the President in the Chair.

The minutes of last meeting were read and confirmed.

It was moved by Mr. Vandersmissen, seconded by Dr. Kennedy, and resolved,—" That the following gentlemen be a committee to consider the advisability of dividing the Institute into sections, in accordance with the suggestions contained in the President's Inaugural Address, and to report upon a scheme for that purpose if advisable: the President, the Secretary, Mr. Boyle, Mr. Geo. E. Shaw, Mr. J. M. Buchan, Mr. Alan Macdougall, Prof. Loudon, Mr. Murray, and the mover and seconder."

The following list of donations and exchanges was read:

1. The Canadian Entomologist, XVII., Nos. 1 and 2, January and February, 1885.
2. Science, Vol. V., No. 107, February 20th, 1885.
3. Journal of the New York Microscopical Society, Vol. I., No. 2, February, 1885.
4. Journal of the Anthropological Institute of Great Britain and Ireland, Vol. XIV., No. 3; February, 1885.
5. Boletin de la Academia de Ciencias in Cordoba (Republica Argentina), Tomo VII., Entrega 1*a*, 2*a*.
6. Annaes da Escola de Minas de Ouro Preto, No. 3., Rio de Janeiro, 1884.
7. Mémoires et Compte Rendu des Travaux de la Société des Ingénieurs Civils, 4*e* Sérié, 36*e* Annéc, 12*e* Cahiér, December, 1883, 4*e* Sérié, 37*e* Année 8*e*, et 9*e* Cahiér, Août et Septembre, 1884.
8. Les Annales des Mines :—

   Sêptieme Série, Mémoires, Tome XVI., 6*e* Livraison de 1879, Tomes XVII., XVIII., XIX., XX., 1880, 1881. Huitième Série, Mémoires, Tomes I., II., III., IV., V., Livraison 1*re* 2*e*, 3*e*, Tome VI., Livraison 4*e*, 5*e*, 1882, 1883, 1884. Lois Décrets, Arrêts, 1880, 1881, 1882, 1883. 7*e* Série, Tomes IX., X. 8*e* Série, Tomes I., II.
9. Proceedings of the Conference relating to a Prime Meridian, from the Dominion Government.

Mr. John Phillips read a paper on "The Centrifugal Forces of the Planets."

The object of the paper was to establish the proposition that the moon was projected vertically from the earth at an initial velocity of about seven miles a second, the earth and moon having originally formed a single mass. Mr. Phillips showed the process by which he determined the velocity with which a heavy body falling from a state of rest towards the earth from the distance of the moon would strike the earth's surface, this being also the initial velocity with which a body would have to be projected in order to ascend to that distance. Having exhibited the formulæ and substituted for the general terms the particular quantities as determined by observation, he found this velocity to be 36,707 feet per second, or 253 feet less than seven miles. He then showed the effect upon a body so projected of the rotary motion of the earth, and of the perturbation caused by the sun's attraction, and how these forces combined would give such a body exactly the orbit in which the moon actually moves. Having also indicated how the permanency of the system is ensured, he deduced the conclusion as irresistible that this is how the moon was projected into her present orbit.

Mr. Livingstone took exception to some of the positions of the paper, and drew special attention to his doctrine that there is no such thing as centrifugal force at all, but that orbital motion is only vibration.

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PROCEEDINGS
OF
THE CANADIAN INSTITUTE,
SESSION 1885-86.

PRIMÆVAL DEXTERITY.

BY DANIEL WILSON, LL.D., F.R.S.E.,
President of University College, Toronto.

[The facts in reference to "The Bohemian Skull" (see *ante*, page 43) having since the reading of the paper been made public elsewhere, Dr. Wilson furnishes the following paper for publication in lieu of it.]

In a communication made to the Canadian Institute in 1871, and subsequently printed in the *Canadian Journal*,* I drew attention to an interesting discovery, supposed to indicate the traces of a left-handed workman of prehistoric times. The Rev. William Greenwell carried out a series of explorations of a number of flint-pits, known as Grimes' Graves, near Brandon, in Norfolk ; and in a communication to the Ethnological Society, of London, on the subject, he states that in clearing out one of the galleries excavated in the chalk by workmen of the remote Neolithic Age in order to procure flint nodules in a condition best adapted for the purpose of the flint tool-maker, it became apparent that, while the pits were still being worked, the roof of the gallery had given way and blocked up its whole width. The removal of this obstruction disclosed three recesses extending beyond the chalk's face at the end of the gallery, which had been excavated by the ancient miners. In front of two of those recesses lay picks made from the antlers of the red deer.

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* *Canadian Journal*, N. S., Vol. XIII., p. 208.

They corresponded to other deer's-horn implements found in various parts of the shafts and galleries. But Canon Greenwell noted that, while in the case of the two implements specially observed by him, the handle of each lay towards the mouth of the gallery, the tines which formed the blades of the picks pointed towards each other, suggesting, as he conceived, that in all probability they had been used respectively by a right and a left-handed miner. The day's work over, the men had laid down their tools ready for the next day's work; meanwhile the roof fell in, and the picks were left undisturbed through all the intervening centuries, till the reopening of the gallery.

The circumstance, though worthy of note, among the other details recorded by an accurate observer, could not in itself be regarded as of great weight in its bearing on the general question of the origin or prevalence of right or left-handedness. But any evidence tending to throw light on the usage in prehistoric times has a significance and value in reference to the original and very general use of the right hand where special dexterity is required. The question of the reason for such preference was brought under the notice of Carlyle by painful experience near the close of his life. It was his sad misfortune, when he had reached the advanced age of seventy-five, to lose the use of his right hand. The period of life was too late to turn with any hope of success to the untrained left hand; and more than one entry in his journal refers to the irreparable loss. But one curious embodiment of the reflections suggested by this privation is thus recorded upwards of a year after experience had familiarized him with all that the loss involved :—" Curious to consider the institution of the Right Hand among universal mankind; probably the very oldest human institution that exists, indispensable to all human coöperation whatsoever. He that has seen three mowers, one of whom is left-handed, trying to work together, and how impossible it is, has witnessed the simplest form of an impossibility, which but for the distinction of a 'right hand,' would have pervaded all human things. Have often thought of all that,—never saw it so clearly as this morning while out walking, unslept and dreary enough in the windy sunshine. How old? Old! I wonder if there is any people barbarous enough not to have this distinction of hands; no human Cosmos possible to be even begun without it. Oldest Hebrews, &c., writing from right to left, are as familiar with the world-old institution as we. Why that particular hand was chosen is a question not to be settled, not worth asking except as a kind of riddle; probably arose in fighting; most important to protect your heart and its adjacencies, and to carry the shield on that hand."

The reference to "oldest Hebrews" no doubt had in view what may be regarded as the earliest known statistics of left-handedness on record. The account given in the Book of Judges of the remarkable skill manifested by the left-handed Benjamite warriors is worthy of special note. Left-handedness, if not more prevalent among the tribe of Benjamin than in other Hebrew tribes, appears to have attracted such special attention that those who were noted for it were organized into a separate body of marksmen, renowned for their matchless skill with the sling, as well as for their general dexterity. Ehud, the son of Gera, the deliverer of his people from the servitude of Eglon, King of Moab, was a Benjamite, a man left-handed: and so, as he snatched from his right side the dagger with which he slew the Moabitish king, the motion of his left hand would not excite suspicion. But the very form of the record shows the attribute to be exceptional; and all the more so as occurring in the tribe whose name—*ben yamin*, the son of my right hand,—so specially marks the sense of dignity and honour associated with the right hand. Hence the reference to this select body of seven hundred skilled marksmen is due to the fact that their use of the left hand was at variance with the general practice of their tribe. Had any ancient left-handed people come under the observation of the historical nations whose records have come down to us, this reference to the left-handed Benjamites shows that the fact would have been noted; for the entire number of left-handed slingers barely amounted to 2·7 per cent. Out of twenty-six thousand Benjamites, as we are told, all warriors, there were seven hundred chosen men of the tribe, every one of whom was left-handed, and could sling stones at a hair's-breadth and not miss. Nearly the same relative number, viz., two per cent., is assigned by Professor Hyrtl, of Vienna, as the proportion of left-handed persons at the present day, as determined from observations made by him in one of the most civilized centres of modern Europe.

But some recent disclosures give promise of evidence derived from greatly more ancient records even than the Hebrew scriptures. Discoveries in the department of prehistoric archæology have greatly extended our knowledge of the history of the human race; and have opened vistas through which we already look on many novel revelations such as, at no very distant period, it would have seemed folly to imagine possible. We are as yet but on the threshold of such disclosures, and only imperfectly interpret the new chronicle. But among those already suggested by its study, one subordinate illustration of attributes characteristic of primitive man appears to be the evidence that among the palæolithic workers in flint, and the singularly gifted draftsmen of Europe's Mammoth and Reindeer periods, a preferential use of the right hand prevailed nearly as much as in historic times. The remoteness of such evidence, and its manifest freedom from all the artificial influences of civilization, give it a special value in any attempt to determine the source of right-handedness. No human cosmos, as Carlyle says, can by any possibility be even begun without this distinction of hands; and yet the precise cause of the nearly universal preference of the right hand appears to elude alike the research of the historian and the investigations of the physiologist.

The classification of man, apart from all other animals, as a separate order of *Bimana,* though no longer accepted as one fulfilling the requirements of science, is an indication of the characteristic significance attached to the human hand. It is an organ so delicately fashioned, and, in the daily actions of life employed with such remarkable skill in all the multifarious requirements of the soldier and seaman, the skilled artizan, the needlewoman, the clerk, the surgeon, the artist, musician, &c., that the biologist was not unnaturally directed to it when in search of a typical basis of classification. By reason of its mobility and its articulated structure, it is specially adapted as an organ of touch; and the fine sense which education confers on it tends still further to widen the difference between the human hand and that of the ape. But also, whether solely as a result of education, or traceable to some organic difference, the delicacy of the sense of touch, and the manipulative skill and mobility of the right hand, in the majority of cases, is found so far to exceed that of the left that a term borrowed from the former expresses the general idea of dexterity. That education has largely extended the preferential use of the right hand is undoubted. That it has even tended to unduly displace the left hand from the exercise of its manipulative function, I fully believe. But so far as appears, in the preference of one hand for the execution of many special operations, the choice seems, without any concerted action, to have been that of the right. Not that there are not many left-handed workmen, artificers and artists, often characterized by unusual skill; but, the farther investigation is carried, the more apparent it becomes that such cases present exceptional deviations from what seems to be the normal usage of humanity. If the source of this characteristic preference is referable to any peculiarity in the structure of the hand, or of related organs, it ought to be easily explicable. Thus far, indeed, notwithstanding much patient research, it remains unexplained. Yet if it be no more than an acquired habit produced by the necessities indispensable to combined action, it is scarcely conceivable that no left-handed nation should be found. It is in this aspect that the evidence of archæology has such special value. If, far behind oldest historic periods, in the prehistoric dawn, it can be shown that man appears to have manifested the same preference for the right hand which we know him to have done throughout the historic period, it will no longer be possible to question that it has its origin in some obscure organic source. Carlyle, looking to man in his primitive stage as preëminently a fighting animal, assigns the original distinction of hands, as others have done before him, to the necessarily passive shield-bearing hand, as contrasted with that of the sword. With the origin of combined action in war, a choice would have to be made as to the side on which the shield was to be carried, if men were to fight in phalanx.

That such a distinction did exist from remote times is proved by some of the oldest Egyptian and Etruscan paintings, by Assyrian sculptures, and some of the most archaic Greek vases. The right side was *ἐπὶ δόρυ*, the spear side, while the left was *ἐπ' ἀσπίδα*, the shield side. The familiar application of the terms in this sense is seen in Xenophon's "Anabasis," IV. iii. 26, *Καὶ παρήγγειλε τοῖς λοχαγοῖς ϰατ' ἐνωμοτίας ποιήσασθαι ἕϰαστον τὸν ἑαυτοῦ λόχον, παρ' ἀσπίδας παραγαγόντας τὴν ἐνωμοτίαν ἐπὶ φάλαγγος*, "He ordered to draw up his century in squads of twenty-five, and post them in line to the left." And again, Anabasis, IV. iii. 20: *Τοῖς δὲ παρ' ἑαυτῷ παρήγγειλεν* . . . . *ἀναστρέψαντας ἐπὶ δόρυ, ϰ.τ.λ.*, "He ordered his own division, turning to the right," etc. Egyptian paintings, though older than the earliest Greek vases, are less reliable; for in the symmetrical arrangements of hieroglyphic paintings the groups of figures are habitually reversed, right and left, looking toward a central line or point. Nevertheless the evidence of righthandedness is manifest. But the discoveries of recent years in the caves of the Dordogne, in Southern France; and subsequently in Belgium, Switzerland, and England, have familiarised us with drawings of vastly greater antiquity than the earliest examples of Egyptian art.

Two sources of evidence in reference to the dexterity of the men of prehistoric times can now be appealed to: 1st. Their flint implements, so abundant, and so widely diffused; and 2nd. The carvings and drawings of palæolithic man. Of those earliest traces of man's handiwork, the implements of the River-drift Period are at once the rudest and most primitive in character. They occur in vast numbers, among the rolled gravel of the ancient fresh-water, or river-drifts, which belong to what has received from the included implements the name of the *Palæolithic Period;* and if they are correctly assumed to represent the sole appliances of the man of the Drift Period, they indicate a singularly rude stage. In reality, however, the large, rude almond and tongue-shaped implements of flint are nearly imperishable; while trimmed flakes, small daggers or arrow heads, and other delicately fashioned flint implements—as well as any made of more perishable materials, such as shell, wood, or bone,—must have been fractured in the violence to which the rolled gravels were subjected, or would perish by natural decay. Nevertheless the Drift Folk and the primitive Troglodytes of Europe have transmitted examples of their industry and skill in sufficient number to enable us to turn them to account for the present purpose. Their mode of working is now well understood; for the process of the ancient arrow-maker is no lost art. It has been in use among many barbarous races: and is still practised by some of the Indian tribes of this continent, to whom it has doubtless been transmitted through successive generations from remote times. The modes of manufacture vary somewhat among different tribes: but they have been repeatedly witnessed and described by explorers who have watched the native arrow-maker at work; and his operations no longer present the difficulties which were long supposed to beset them. Among the rarer primitive implements are hammer-stones, oblong or rounded in shape, most generally with cavities worked in two faces, so as to admit of their being conveniently held between the finger and thumb. Implements of this class have been repeatedly recovered from the

French caves; an interesting example occurred among the objects embedded in the red cave-earth of Kents's Hole, Devonshire; and others, of different periods, usually quartzite pebbles, or nodules of flint, have been found in many localities. Some of them were probably used in breaking the larger bones to extract the marrow; but the battered edges of others show their contact with harder material. Similar hammer-stones occur in the Danish peat-mosses, in the Swiss lake dwellings, and on our own continent, among other remains of the arts of the aborigines.

The mode of fashioning the large, tongue-shaped implements and rude stone hatchets, which are among the most characteristic drift implements, it can scarcely be doubted, was by blows of a stone or flint hammer; as was obviously the case with some large flint or horn-stone implements recovered from the pits of the Flint Ridge, a silicious deposit of the carboniferous age, which extends through the State of Ohio, from Newark to New Lexington.* At various points along the ridge, funnel-shaped pits occur, varying from four or five to fifteen feet deep; and similar traces of ancient mining may be seen in other localities, as at Leavenworth, about three hundred miles below Cincinnati, where the grey flint, or chert, abounds, of which large implements are chiefly made. The sloping sides of the pits are in many cases covered with the fractured flints, some of them partially shaped as if for manufacture. The work in the quarry was, no doubt, the mere rough fashioning of the flint by the tool-makers, with a view to facility of transport, in many cases, to distant localities. But the finer manipulation, by means of which the carefully-finished arrow-heads, knives, lances, hoes, drills, scrapers, etc., were manufactured, was reserved for leisurely and patient skill. It is now known that the more delicate operations in the finishing of the flint implements were done by means of pressure with a horn or bone arrow-flaker; and not by blows with a chisel or hammer. Specimens of the arrow-flakers in use by the American Indian and the Eskimo workers in flint are familiar to us. Different forms of those instruments are engraved among the illustrations to "The Ancient Stone Implements, Weapons, and Ornaments of Great Britain;"† and Dr. Evans describes the mode of using them as witnessed by Sir Edward Belcher among the Eskimo of Cape

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* Prehistoric Man, 3rd Ed., i. 70, Figs. 5, 6 and 7.

† Evans' Stone Implements, Figs. 8, 9, 10.

Lisburne, and quotes accounts of methods pursued among the native Mexicans, and the Shasta Indians of California. Another, and in some respects more minute description of the process, in use by the Wintoon Indians, is furnished by Mr. B. B. Redding, in the *American Naturalist*, from his own personal observation. The artificer was Consolulu, the aged chief of the Wintoon Indians, and the material, as among the Shasta Indians, was obsidian; but the process is equally applicable to flint; the cleavage of which is nearly similar. His implements consisted of a deer-horn prong split lengthwise, four inches long, and half an inch thick, with the semicircular ends at right angles; two deer-horn prongs, one smaller than the other, with the ends ground down nearly to the shape of a square sharp-pointed file; and a piece of well-tanned buckskin. thick, soft, and pliable. Laying, as we are told, a lump of obsidian, about a pound in weight, in the palm of the left hand, he placed between the first and second fingers of the same hand the semi-cylindrical deer-horn implement, so that the straight side of one of the ends rested about a quarter of an inch from the edge of the block of obsidian With a small waterworn stone, in his right hand, he struck the other end of the prong, and a flake of obsidian was severed well adapted for the arrow-head. On the buckskin, in the palm of his left hand, he laid the obsidian flake, which he held in place by the first three fingers of that hand, and then took such a position on the ground that the left elbow could rest on the left knee and obtain a firm support. Holding in his right hand the larger of the two pointed prongs, and resting his thumb on the side of his left hand to serve as a fulcrum, he brought the point of the prong about one-eighth of an inch within the edge of the flake; and then, exerting a firm downward pressure, fragment after fragment was broken off until the edge of the arrow was made straight. As all the chips came off the lower edge, the cutting edge was not yet in the centre of the side. But the arrow-maker rubbed the side of the prong repeatedly over the sharp edge, turned over the flake, and, resuming the chipping as before, brought the cutting edge to the centre. In a similar manner, the other side and the concave base of the arrow-head were finished. The formation of indentations near the base for the retention of the tendons to bind the arrow-head securely to the shaft, apparently the most difficult process, was in reality the easiest. The point of the arrow-head was held between the thumb and finger of the left hand, while the base rested on the buckskin cushion in the palm. The point of the smaller deer-horn prong, not exceeding one-sixteenth of an inch square, was brought to bear on the part of the side where the notch should be; a sawing motion made the chips fly to right and left, and in less than a minute it was cut to the necessary depth. The other side was then completed in like manner, and the arrow-head was finished in about forty minutes.

In the above narrative the use of the right hand in all the active manipulations of the Indian arrow-maker is assumed; though probably with no conscious purpose of emphasising what is the ordinary and normal practice. But the details are in other respects full of interest from the light we may assume them to throw on the method pursued by the primitive implement makers of the earliest stone age. Dr. Evans describes and figures a class of flint tools recovered from time to time, the edges of which, blunted and worn at both ends, suggest to his experienced eye their probable use for chipping out arrow-heads and other small implements of flint, somewhat in the fashion detailed above with the tool of deer's horn; and which we may, perhaps, presume were used before the discovery of the greater aptitude of horn or bone tools for the object in view. Some of the flint-flakers are carefully wrought into the form best adapted for being held in the hand of the workman. But whether fashioned by means of flint or horn fabricator, the material to be operated upon has to be held in one hand, while the tool is dexterously manipulated with the other. Signor Craveri, whose long residence in Mexico gave him very favourable opportunities for observing the process of the native workers in obsidian, remarks that, when the Indians "wish to make an arrow or other instrument of a splinter of obsidian, they take the piece in the left hand, and hold grasped in the other a small goat's horn. They set this piece of obsidian upon the horn, and dexterously pressing it against the point of it, while they give the horn a gentle movement from right to left, and up and down, they disengage from it frequent chips; and in this way obtain the desired form."* Again, in an account communicated to Sir Charles Lyell by Mr. Cabot, of the mode of procedure of the Shasta Indian arrow-makers, after describing the detachment of a piece from the obsidian pebble with the help of an agate chisel, he thus proceeds: "Holding the piece against the anvil with thumb and finger of his left hand, he commenced a series of blows, every one of which chipped off fragments of the brittle substance." The patient artificer worked upwards of an hour before he succeeded in producing a perfect arrow head. His ingenious skill excited the admiration of the spectator, who adds the statement that, among the Indians of California, arrow-making is a distinct profession, in which few attain excellence.

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* Translated from Gastaldi. See Evans' Stone Implements, p. 36.

In the various narratives, as will be seen, right-handedness is not only assumed as the normal, but as the invariable characteristic of the worker in obsidian or flint. But an ingenious investigator, Mr. F. H. Cushing, of the Smithsonian Institution, while engaged in a series of tentative experiments to determine the process of working in flint and obsidian, had his attention accidentally called to the fact that the primitive implements of the Stone Age perpetuate for us a record of the use of one or the other hand in their manufacture. With the instinctive zeal of youthful enthusiasm, Mr. Cushing, while still a boy, on his father's farm in Western New York, carried out a series of flint workings with a view to ascertain for himself the process by which the ancient arrow-makers fashioned the flint implements that then excited his interest. In his various attempts he aimed at placing hinself in the same conditions as the primitive manufacturer of Europe's Stone Age, or of the ancient Mound Builders of this Continent, devoid of metallic tools, and with the flint, obsidian, jasper, or hornstone, as the most available material out of which to fashion nearly all needful implements. He set to work accordingly with no other appliances than such sticks, and variously shaped stones, as could be found on the banks of the streams where he sought his materials. The results realize to us, in a highly interesting way, the earliest stages in the training of the self-taught workman of the Palæolithic Age. After making various implements akin to the most rudely fashioned examples from the river-drift or the old flint pits, by means of chipping one flint or stone with another, he satisfied himself that no amount of chipping, however carefully practised, would produce surfaces like the best of those which he was trying to imitate. He accordingly assumed that there must be some other process unknown to him. By chance he tried pressure with the point of a stick, instead of chipping with a stone, and the mystery was solved. He had hit on the method in use by Aztecs, Eskimos, and Red Indians; and found that he could fashion the fractured flint or obsidian into nearly any shape that he desired.

I have recently learned from Mr. Cushing, that the instrument employed by him in some of those experiments was the same which Dr. John Evans informs me he accidentally hit upon in his earliest successful efforts at flint arrow-making, viz., a tooth-brush handle. In thus employing a bone or horn flaker, the sharp edge of the flake cuts slightly into the bone; and when the latter is twisted suddenly upward, a small scale flies off at the point of pressure in a direction which can be foreseen and controlled. With this discovery the essential process of arrow-making had been mastered. Spear and arrow-heads could be flaked with the most delicate precision, with no such liability to fracture as leads to constant failure in any attempt to chip even the larger and ruder spear or axe-heads into shape. The hammer-stone only suffices for breaking off a flake from the rough flint nodule, and trimming it roughly into the required form, preparatory to the delicate manipulation of edging, pointing, and notching the arrow-head. The thinning of the flint-blade is effected by detaching long thin scales or flakes from the surface by using the flaker like a chisel and striking it a succession of blows with a hammer-stone. The marks of this surface-flaking are abundantly manifest on the highly-finished Danish knives, daggers, and large spear-heads, as well as upon most other flint implements of Europe's Neolithic Age. The large spear and tongue-shaped implements of the drift are, on the contrary, rudely chipped, evidently by the blows of a hammer-stone; although some of the drift implements seem to indicate that the use of the flint or bone flaker was not unknown to the men of the Palæolithic Age. But the chipping-stone or hammer was in constant use at the later period; and small hammer-stones with indentations on the sides for the finger and thumb, and with their rounded edges marked with the evidence of long use in chipping the flint nodules into the desired forms, abound both in Europe and America, wherever the arrow-maker has carried on his primitive art. The implements in use varied with the available material. A T-shaped wooden flaker sufficed for the Aztecs in shaping the easily worked obsidian. The jasper, chalcedony, and quartz, in like manner, yield readily to the pressure of a slender flaker of horn; whereas Mr. Cushing notes that the "tough hornstone of Western Arctic America could not be flaked by pressure in the hand, but must be rested against some solid substance, and flaked by means of an instrument, the handle of which fitted the palm like that of an umbrella, enabling the operator to exert a pressure against the substance to be chipped nearly equal to the weight of the body." One result of Mr. Cushing's experiments in arrow-making was to satisfy him that the greatest difficulty was to make long narrow surface-flakes. Hence, contrary to all preconceived ideas, it is easier to form the much-prized delicately finished small arrow-heads, with barbs and stem, than larger and seemingly ruder implements which involve much surface-flaking.

It is interesting to learn of the recovery of what was supposed to be the lost art of the ancient arrow-makers by a series of tentative experiments independently pursued by different observers; and to find the newly-discovered process confirmed by the methods still in use by widely-scattered aboriginal tribes. So far the results of Mr. Cushing's experiments agree with those of other observers; but in the course of his operations he also noted this fact that the grooves produced by the flaking of the flint, or obsidian, all turned in one direction. This proved to be due to the constant use of his right hand. The first procedure is to strike off a suitable flake from the block of flint. This is then trimmed roughly with a hammer-stone into a leaf-shape, which is reduced in thickness by scaling off surface flakes with repeated blows upon the edge. Then comes the delicate process of finishing, pointing, and notching the arrow or lance-head with the bone flaker. Surface-flaking, or the thinning of the flint blade by the detachment of flakes running from the edge to the centre, is the most difficult part of the process. The method employed to effect this, by direct blows with a hammer-stone, by pressure with a wood or bone flaker, or by combining the two, and using the bone or stone flaker as a chisel, can always be detected. Each method leaves its traces on the finished implement; and in the extreme cases of the rudely chipped flint implements of the drift, and the highly finished flint daggers and axes of the Danish mosses and shell-heaps, the contrast is very striking. Mr. Cushing also notes that in flaking a large arrow or spear-head in the hand it is necessary to hold it alternately by the point and by the base. As the grasp by the base is much firmer the pressure is greater; and hence the flakes scale off further toward or over the centre. As this unavoidably happens on opposite edges, a twisted and at times a distinctly bevelled point is the result; especially when the material worked upon is unusually hard. This accounts for the bevelled type of arrow and spear-head of comparatively common occurrence, and which has been assumed by some to be designed for the same end as the rifling of a musket; but as the bevel or twist appears to be almost invariably in the same direction, Mr. Cushing arrived at the conclusion that the aboriginal arrow-makers were, like ourselves, a right-handed people. But if so, there were exceptions to the rule then as now. When the flaker is held in the left hand, so that the direction of pressure by the bone or stick is reversed, the result is apparent in the opposite direction of the grooves. So far as his observations extended, he occasionally found an arrow-head or other primitive stone implement with the flake grooves running from left to right, showing, as he believed, the manipulations of a left-handed workman; but, from the rarity of their occurrence, it might be assumed that, as a rule, prehistoric man was right-handed. When the results of those investigations into the arts of the Stone Age were reported at a meeting of the Anthropological Society of Washington, in May, 1879, Professor Mason confirmed from his own observation the occurrence of flint implements indicating by the reversed direction of the bevelling that they were produced by left-handed workmen. Mr. Cushing further notes that "arrow-making is accompanied by great fatigue and profuse perspiration. It has a prostrating effect upon the nervous system, which shows itself again in the direction of fracture. The first fruits of the workman's labour, while still fresh and vigorous, can be distinguished from the implements produced after he had become exhausted at his task; and it is thus noteworthy that on an unimpressible substance like flint even the moods and passions of long-forgotten centuries may be found thus traced and recorded."

The evidence thus appealed to is equally applicable to modern as to ancient workers in flint; and should a sufficient number of observers consider the question of sufficient importance to induce them to examine and report on the relative number of examples of what are thus assumed to be the result of left-handed manipulation, it is obvious that the class of implements referred to offers a trustworthy source of evidence whereby to arrive at an estimate of the prevalent use of one or the other hand among uncultured races alike in ancient and modern times.

When engaged in some more general inquiries into the evidence of the preferential use of the right hand among modern savage races, I appealed to the experience of my friend Dr. John Rae, who, like myself, is inveterately left-handed, to ascertain if he had noted any such habit among the Eskimos, or among the Indian tribes bordering on the Hudson's Bay, among whom he long resided. In his reply he informs me that, without having taken particular notice of Indian or Eskimo preference for one or other hand, he observed that some among the latter were markedly ambi-dextrous. But, he adds, "from a curious story told me by an Eskimo about a bear throwing a large piece of ice at the head of a walrus; and telling me, as a noteworthy fact, that he threw it with the left forepaw, as if it were something unusual, it would seem to indicate that left-handedness was not very common among the Eskimos."

So far as Mr. Cushing's observations and experiments supply any satisfactory basis for the determination of the question as to the general prevalence of right-handedness, they point unmistakably to such a conclusion, and he definitely advances the opinion that, with few and rare exceptions, primitive man was right-handed. The evidence thus far adduced is insufficient for an absolute determination of the question; but any strongly-marked examples of the left-handed workman's art among palæolithic flint implements appear to be exceptional. No higher authority than Dr. John Evans can be appealed to in reference to the manipulations of the primitive flint-worker, and, in writing to me on the subject, he remarks: "I think that there is some evidence of the flint-workers of old having been right-handed: the particular twist, both in some palæolithic implements, as in one in my own possession, from Hoxne, in Suffolk, and in some American rifled arrow-heads, being due to the manner of chipping, and being most in accordance with their being held in the left hand and chipped with the right." In the detailed description, given in his "Ancient Stone Implements of Great Britain," of the Hoxne example above referred to, he remarks: "It presents the peculiarity, which is by no means uncommon in ovate implements, of having the side edges not in one plane, but forming a sort of ogee curve. In this instance the blade is twisted to such an extent, that a line drawn through the two edges near the point is at an angle of at least 45° to a line through the edges at the broadest part of the implement. I think," he adds, "that this twisting of the edges was not in this case intended to serve any particular purpose, but was rather the accidental result of the method pursued in chipping the flint into its present form."* A similar curvature is seen in a long-pointed implement from Reculver, in the collection of Mr. J. Brent, F.S.A., and again in another large example of this class, from Hoxne, presented to the Society of Antiquaries of London, upwards of eighty years ago. This, as Dr. Evans notes, exhibits the same peculiarity of the twisting of the edges so markedly, and indeed so closely resembles the specimen in his own collection, that they might have been made by the same hand. Of another example, from Santon Downham, near Hetford, Suffolk, almond-shaped, and with dendritic markings in evidence of its palæolithic date, Dr. Evans remarks: "It is fairly symmetrical in contour, with an edge all round, which is somewhat blunted at the base. This edge, however, is not in one plane, but considerably curved, so that when seen sideways it forms an ogee curve;" and he adds: "I have other implements of the same, and of more pointed forms, with similarly curved edges, both from France, and other parts of England, but whether this curvature was intentional it is impossible to say. In some cases it is so marked that it can hardly be the result of accident; and the curve is, so far as I have observed, almost without exception ς, and not S. If not intentional, the form may be the result of all the blows by which the implement was finally chipped out having been given on the one face on one side, and on the opposite on the other."† In other words, the implement-maker worked throughout with the flaker in the same hand; and that hand, with very rare exceptions, appears to have been the right hand. The evidence adduced manifestly points to the predominance of right-handed men among the palæolithic flint-workers. For if the flint-arrow maker, working apart, and with no motive suggested by the necessity of accommodating himself to a neighbouring workman, has habitually used the right hand from remote palæolithic times, it only remains to determine the cause of a practice too nearly invariable to have been the result of accident.

Unless there be some organic cause for the preference of one hand rather than the other, no systematic use of either hand would be likely to manifest itself in rude states of society where there is little or no call for combined action. Hence a Stone Age is one where traces of it were least likely to occur. But the attention of archæologists and geologists had not been long directed to the extremely rude implements of the drift and the ancient caves, when the disclosures of the latter showed that the art of palæolithic man was by no means limited to operations in flint and stone. Contemporary specimens of carvings in bone and ivory have been preserved, securely sealed up in the cave-breccia, including daggers and lances of deershorn and maces or batons of the same material, all decorated with more or less artistic skill. Other remains of the ancient workmen still more strikingly illustrate their æsthetic taste, and at the same time serve to throw light on the prevalence of right or left-handedness among the skilled artificers of Palæolithic or Neolithic Ages; as well as on the more important question of the intellectual development of primitive man. Within the last twenty years repeated discoveries in ancient cave-dwellings and retreats of Europe, and especially in those of southern France, have familiarized us with numerous specimens of the work of skilled draftsmen of Palæolithic Europe. The evidence they afford of the dexterity which these cave-men displayed in sketching and engraving on slate, horn, and ivory has been very widely recognized; but my attention was first directed to the possible clue which they might furnish to the prevalent use of one or other hand in that remote age, by what, on further investigation, proved to be an error in the reproduction of the famous drawing of the Mammoth on a plate of its own ivory, found in the Madelaine Cave, in the Valley of the Vézère. In M. Louis Figuier's "L'Homme Primitif," for example, which might be assumed as a reliable authority in reference to the illustrative examples of French palæolithic art, the La Madelaine Cave sketch is incorrectly reproduced as a left-hand drawing; that is to say, the mammoth is looking to the right. The direction of an unpremeditated profile sketch is a nearly unerring test of right or left-handedness. The skilled artist can, no doubt, execute a right or left profile at will; but in the ordinary use of the pencil a profile drawing, if done by a right-handed draftsman, will be represented looking to the left; as, if it is the work of a left-handed draftsman, it will certainly look to the right.

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* Ancient Stone Implements, p. 520.

† Ancient Stone Implements, p. 501.

The drawings of the ancient cave-men of Europe have naturally attracted much attention. They are referable, beyond all dispute, to a period of long duration, when the mammoth and woolly rhinoceros, the fossil horse, the Irish elk, the cave-bear, cave-lion, and cave-hyæna, with other extinct fauna, were to be found immediately to the north of the Pyrenees, along with the musk-sheep, the reindeer, and other Arctic mammals. The evidence of remote antiquity of the period marked by this extinct fauna, is of so comprehensive a character that it may be assumed to have now received universal acceptance. Any indications, therefore, of special intellectual capacity, such as the carvings and drawings of the cave-men reveal, are of special significance.

These examples of primitive art are of varying degrees of merit. Some may be compared with the first efforts of any untutored youth; while others, such as the La Madelaine mammoth and the grazing reindeer from the Kesserloch, furnish evidence of the observant eye and the practised hand of the skilled draftsman. Among a series of fanciful illustrations introduced by M. Louis Figuier in his "L'Homme Primitif," is a group of artists of the Reindeer epoch at work. Three men of fine physique, slightly clad in skins, stand or recline in easy attitudes, sketching or carving as a modern artist might do in the lighter hours of his practice. One stands and sketches a deer with free hand on a piece of slate, which rests against a ledge of rock as his easel. Another, seated at his ease, traces a miniature device with, it may be, a pointed flint, on a slab of bone or ivory. The third is apparently carving or modelling a deer or other quadruped. All are, as a matter of course, represented with the stylus, graver, or modelling tool in the right hand; the question of possible left-handedness not having occurred to the modern draftsman.

On the assumption of the significance of the direction of the profile, as a test of right or left-handedness, the following is the result of its application to the evidence of this class thus far available. The mammoth-drawing from the La Madelaine cave; the bison, imperfect, showing only the hindquarters; and the ibex, on a reindeer-antler, from Laugerie Basse; the group of reindeer, from the Dordogne, two walking and one lying on its back; the cave bear of the Pyrenees, from the cave of Massat, in the department of Ariége; and another representing a hunter stalking the Urus, may all be regarded as right-hand drawings. But the horses from La Madelaine, engraved on reindeer-antler, specially noticeable for their large heads; the horse, from Creswell Crags; the ibex, with legs in the air; and, above all, the remarkably spirited drawing of the reindeer grazing, from Thayngen in the Kesserloch—a sketch, marked by incident both in the action of the animal and its surroundings, suggestive of an actual study from nature;—all appear to be left-hand drawings.

The number of examples thus far adduced is obviously too small to admit of any general conclusion as to the relative use of the right or left hand being based on their evidence; but so far as it goes, it suggests a much larger percentage of left-handed draftsmen than is to be looked for on the assumption that right-handedness is the normal condition of man. It indicates, moreover, the importance of keeping in view the distinction between the preferential use of either hand by the cultured and skilled workman, or the artist, and its employment among rude, unskilled labourers engaged in such toil as may be readily accomplished by either hand. That the use of the left hand is transmitted from parent to child; and so, like other peculiarities, is to some extent hereditary, is undoubted. This has, therefore, to be kept in view in drawing any comprehensive deductions from a few examples confined to two or three localities. It may be that the skilled draftsman of the Vézère, or the gifted artist to whom we owe the Kesserloch drawing, belonged to a family, or possibly a tribe, among whom left-handedness prevailed to an unusual extent, along with an amount of skill and dexterity such as is frequently seen to accompany the instinctive use of the left hand. In such circumstances left-handedness would be apt to be developed not only hereditarily but by imitation. Yet even among those palæolithic draftsmen a preference for the right hand was evinced by the majority.

The more the subject is studied, the more it becomes manifest that education, with the stimulus furnished by the necessities arising from combined action, have much to do with a full development of right-handedness. There is considerable evidence in favour of the idea that in the majority of children, the bias leading to the preference for either hand is so slight that no greater effort would be required to develop the preferential use of the left than of the right hand. But with a certain number the use of the right hand is natural and instinctive. Others again are conscious of an equally strong impulse to use the left hand; and though education may control this, it cannot eradicate it. In any enquiry, therefore, into the degree of prevalence of right-handedness, and its instinctive, organic, or congenital origin, the evidence derived from uncultured classes and races is most reliable. In the conditions of savage life, where combined action is rare, there is little to interfere with the independent action of each individual in following his own natural bias. But so soon as coöperation begins to exercise its restraining and constraining influences, a very slight bias, due probably to organic structure, will suffice to determine the preference for one hand over the other, and so to originate the prevalent law of dexterity. The results shown by the ancient drawings of Europe's cave-men perfectly accord with this. In that remote dawn every man did that which was right in his own eyes. Some handled their tools and drew with the left hand; a larger number used the right hand; but as yet no rule prevailed. In this, as in certain other respects, the arts and habits of that period belong to a chapter in the infancy of the race, when the law of dexterity, as well as other laws begot by habit, convenience, or mere prescriptive conventionality, had not yet found their place in that unwritten code to which a prompter obedience is rendered than to the most absolute of royal or imperial decrees.

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ETRURIA CAPTA.

BY JOHN CAMPBELL, M.A.

Professor in the Presbyterian College, Montreal, &c., &c.

Read January 16th, 1886.

I have the honour to report to the Institute, as one of the most important results of my studies in Hittite palæography, the solution of the Etruscan problem. It is unnecessary to occupy time with an account of the many inscriptions in the Etruscan character, and of the attempts that have been made to decipher them, as such information can be obtained from sources open to every reader. Let it suffice to say that thousands of inscriptions have been discovered, and that, up to the present time, no satisfactory translation has been made, even of the briefest.[1]

The original materials with which I intend principally to deal are the epitaphs contained in Lanzi's Saggio di Lingua Etrusca and the Eugubine Tables, so faithfully reproduced in the Atlas accompanying Professor Bréal's ingenious but most unsatisfying translation. Of the Tables, seven only, and a small portion of an eighth, are in the Etruscan character. The rest are written in the Román alphabet, and are Umbrian. These Umbrian tables are being translated, and will shortly be presented to the world as the oldest Celtic document extant. The proof of my discovery is chiefly to be found in the rendering of the Etrusco-Eugubine inscription, which is authenticated by its internal historical unity, the perfect accordance of its grammatical construction and vocabulary with those of a well-known living language, and the harmony between it and the independent Umbrian record. The evidence afforded by the numerous sepulchral inscriptions is necessarily less convincing, as they are brief, consist largely of proper names, present few constructions, and are popular, not classical. But, inasmuch as they are more accessible and more widely known than the Eugubine Tables, I propose to commence my story of decipherment with them.

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[1] Dr. W. Deecke, the leading Etruscologist of the day, claims only 34 words made out "with tolerable certainty," exclusive of proper names. Encycl. Brit. Art. Etruria.

THE ETRUSCAN CHARACTERS.

The radical mistake of all who have sought to read the Etruscan inscriptions has been their acceptance of the assertion, hardly ever called in question, that the phonetic values of the characters are those of the Roman, Greek, or Phœnician letters, with which they correspond in form. Thus, we are treated to such combinations as *Siathlarnthu avils mealchlsc,* and others much more barbarous, which mean nothing in any language on the face of the earth. For this radical error classical writers are not responsible, for the words given as Etruscan by Varro, Festus, Hesychius, and others, bear no resemblance to the uncouth forms of Etruscan as now read.[2] The fault lies with the thirty or more complete bilingual inscriptions, some of which, whether accidentally or through ignorance on the part of the writer of the Latin letters, may easily be made to coincide. Of these, the most misleading is the first in Lanzi's Saggio, which reads in Latin *Lart. Caii Cavlias,* and, in corresponding Etruscan, *L. Cae. Cauliam.* If there be a real correspondence of phonetic characters, such as this example would seem to indicate, between the Etruscan and the Latin, the work of decipherment has been proved an impossibility by the labours of nearly three centuries.[3] I shall show shortly that there is no real coincidence of phonetic values, and that the apparent coincidences in form of character are partly accidental and partly the result of ignorance or a desire to assimilate on the part of the engraver of the Roman letters.

It is now generally agreed that the Etruscans were a Turanian people; the representations of their physical features, their arts and customs, tending all in that direction.[4] Now, while European

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[2] These are referred to on page 154.

[3] "E naturale l'immaginare che gl'ingegnosi Toscani abbiano preso cura d'illustrare il loro antico suolo, ma un forestiero vi ha fatto le piu grandi fatiche, cioè l'inglese Tommaso Demstero. Prima di lui però l'aretino Attilio Alessi aveva posto la mano a questa messe, formato un alfabeto etrusco, e riportate delle iscrizioni fino dal secolo XVI." Pignotti, Storia della Toscana, lib. I., p. 88.

[4] By Turanian I mean neither Indo-European nor Semitic. Apart from the intruding Turks and the Tartars of southern Russia, the existing Turanian populations of Europe are the Ugrians, (Finns, Lapps, Esths, Magyars, etc.,) and the Basques. The Lydian origin of the Etruscans, in spite of the objections of Dionysius of Halicarnassus, has been generally accepted

Aryans adopted the Semitic alphabet, which had been borrowed from the Egyptian hieroglyphic system, we have no evidence that Turanian peoples ever did so. Granting that Semites and Turanians equally borrowed from the hieroglyphics of Egypt their phonographs, it does not follow that they assigned the same values to the hieroglyphics and their later attenuations or letters. The fact that the Hebrews took the hieroglyphics representing an ox, a house, a camel, and a door, to set forth the sounds A, B, G, and D, because these are the initials of aleph, beth, gimel, and daleth, the Hebrew words for ox, house, camel, and door, rather tends to make it probable that a Turanian people would assign to these characters the sounds of the initial letters or syllables of the words denoting the same things in their own language. I say letters *or syllables*, because, of the ancient systems of writing known to us, many, such as the Assyrian, Chaldean, Median, were syllabic, not alphabetic, and such originally was the Persian.[5] The late origin of the vowel points in the Semitic languages seems to indicate that their alphabets were at

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on the joint testimony of Herodotus I. 94, Strabo V. 220, Tacitus Ann. I. iv. 55. See, however, on the other side Rawlinson's Herodotus, Book I., Essay 1. The labours of Professor Sayce and others have established beyond a doubt the early occupation of Lydia, Phrygia, Cappadocia, and other countries of Asia Minor by a Turanian Hittite people: The Monuments of the Hittites, Transactions of the Society of Biblical Archæology, Vol. VII., p. 248. Professor Sayce says, (p. 249), "The chief monuments of the class to which I refer (Hittite) are found carved upon the rocks at Boghaz Keui, supposed to represent the classical Pteria, and at Eyuk, both of which are situated on the eastern bank of the Halys, and in the line of the high road from Sardis to Armenia. Besides these, others are met with at Ghiaour-Kalessi, in Phrygia, near Frahtin, and on the summit of one of the mountains of the Bulghar Dagh, in Lykaonia; and above all at Karabel, on the road between Ephesus and Sardis." Such are the two pseudo-Sesostris sculptures in Lydia. Further on (p. 272), Professor Sayce remarks: "The remains found by Dr. Schliemann, at Hissarlik, show no traces of Assyrian, Egyptian, or Phœnician influence, but they point unmistakably to Babylonian and Hittite influence." And on the same page: "It is also possible that the Lydian tradition recounted by Herodotus, which derived the Heraklid dynasty from Ninus, the son of Belus, was an echo of the fact that Sardis had once been in Hittite hands." The Lycian and Phrygian alphabets, which have been read in much the same way as the Etruscan, I include in my scheme of Turanian syllabarios.

[5] The cuneiform characters of Babylon, Nineveh, and Media, are accessible to the general reader in Lenormant and Chevalier's Ancient History of the East, vol. I., p. 436, *seq.* About 90 such characters are there represented, having such values as ba, bi, bu, ga, gi, gu, da, di, du, akh, ikh, ukh, li, lu, al, il, ul, &c. For the Persian, see vol. II., p. 122, where Lenormant says: "Originally, it was probably syllabic." The present Japanese syllabaries called Hiragana and Katakana, which superseded the old Corean about the end of the 9th century, represent each 47 syllables—the latter by the same number of modified Chinese characters, the former by about three hundred such characters. See Aston's Grammar of the Japanese Written Language, p. 8, *seq.* The following are among the syllables represented: ka, ki, ku, ke, ko, ta, chi, tsu, te, to, ma, mi, mu, me, mo. The Tamul alphabet is really a syllabary, but of a kind similar to the Semitic alphabets taken together with the vowel points, although in the case of the Tamul the vowel indicators are incorporated with the consonantal character.

first syllabaries, each character denoting the combined sound of a consonant and vowel. There is, of course, also a bare possibility that phonographs may be complex, representing words, as in the Egyptian, Assyrian, and Chinese, in which case they might receive the name of ideographs ; but in the case of the Etruscan characters this is hardly likely, as the hieroglyphic form has entirely disappeared from them. The problem, therefore, is to find the powers of that Turanian alphabet or syllabary, of which the Etruscan system of writing is one of the variant forms. An attempt to solve the problem necessitates a wide outlook, which shall embrace in comparative study all ancient Turanian methods of speech notation.

THE ANCIENT TURANIAN SYLLABARY.

For several years I have given the greater part of my leisure time to a solution of the problem thus presented, being stimulated thereto by the discovery of the Hittite tablets engraved in hieroglyphic characters at Hamath and Carchemish. These Hittite hieroglyphics, representing human, animal and other figures, like the Egyptian, but less conventionally, I take to be the originals of the Turanian alphabet or syllabary. With the exception of my own transliteration and translation, which is, I now find, very imperfect, these inscriptions have not been read, and are, therefore, unavailable as materials for interpretation in themselves.[6] But it has been shown by Professor Sayce and other students that the alphabetic characters found on Cyprian monuments bear a somewhat similar relation to the hieroglyphics of Syria to that which the hieratic bears to the Egyptian hieroglyphic.[7] The phonetic values of many Cypriote characters

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The same is the case with the Corean and ancient Japanese. For the Corean alphabet and syllabary, see plate 1 of Atlas accompanying Klaproth's Translation of the San Kokf Tsou Ran To Sets, Oriental Translation Fund's Publications.

[6] A friendly critic suggests that my admission of great imperfections in the transliteration and translation of the Hittite inscriptions is not reassuring. Neither in that document nor elsewhere have I made any claim to infallibility ; nor, I trust, shall I ever fail to admit with becoming frankness the errors which are almost unavoidable in the pioneer work which has fallen to me. I do adhere firmly to my reading of the bilingual inscription of Tarkutimme, and of the names Shalmanezer, Sagara, Pisiris, Khintiel, Rezin, Hamath, Hittite, and many other words in the larger inscriptions. Some of the Hittite hieroglyphics I am still in doubt about. To others I find that I attached false phonetic values which I have since corrected. The majority of my identifications I have confirmed by subsequent extensive comparisons with materials not at first accessible to me.

[7] In an article on the Hamathite inscriptions in the Trans. Socy Bib. Archæol, Vol. V., p. 31 Professor Sayce says : "Some time ago I expressed the opinion in the Academy that this earlier system of writing was none other than the hieroglyphics of Hamath." The earlier

have been fixed by the labours of Messrs. Schmidt, Pierides and others, who show that their sounds have little correspondence with those expressed by similar Semito-European letters. Besides the Cypriote, the only other alphabet of like character, the powers of which are certainly known, is the Corean of far Eastern Asia, which furnished me with phonetic values of forms belonging to the Etruscan and other old Turanian syllabaries, as the Cypriote also had done. From Corea, my researches extended in two directions, the one westward towards Siberia, the other eastward to Japan and this continent. To take the Japanese first, I am indebted to the kindness of the Rev. John Edwards for the work of Ban Nobutomo on the ancient Japanese alphabet. This, as he and other Japanese grammarians are agreed, is none other than the Corean, although, in the various inscriptions, it presents many diverging forms. Crossing over to America, the only traces of aboriginal alphabetic writing known to me, which I accept as genuine, are the Grave Creek stone, a true copy of which I owe to Colonel Whittlesey, the Brush Creek stone, of which Mr. Hilder, of St. Louis, sent me a photograph, and the Davenport stones, for the knowledge of which I am indebted to the late Dr. Farquharson.[8] Each of these contains characters agreeing with the Corean; and the larger Davenport stone, by its semi-hieroglyphic forms, suggests a Hittite origin. The connection of the Mound Builders with the Aztec population of Mexico is conceded by many of the most scientific students of American antiquity. The

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system alluded to is that from which the Cypriote syllabary was derived. Again (p. 32) he continues: "A comparison of the forms of the characters in the Cypriote syllabary with those of the Hamathite (Hittite) inscriptions seems to me to render it highly probable that both have the same source."

One of the earliest workers in the field of Cypriote Palæography is Professor Moritz Schmidt, of Jena. See his work "Die Inschrift von Idalion, und das kyprische Syllabar." Also many papers in the Trans. Socy. Bib. Archæol. on the subject by Dr. Birch, Dr. Paul Schrœder, Messrs. D. Pierides and I. N. Hall In Germany the names of Deecke, Siegismund, and Brandis, should be added to that of Schmidt. The Cypriote syllabary is accessible to most readers in Cesnola's "Salaminia," where the values are given.

[8] As there has been much controversy in the United States regarding these inscriptions I cannot allow this notice of them to pass without deprecating the tone of those who on *a priori* grounds have assailed their genuineness and cast aspersions of the most serious kind upon the characters of men whose only title to receive anything but respect at the hands of their fellows, was their being connected with the finding of the relics. See an able defence of the Davenport Academy of Natural Science in connection with the tablets by Mr. Charles E. Putnam: Elephant Pipes and Inscribed Tablets of the Mound Builders, Davenport, Iowa, 1885. I mean no disrespect to American scholarship when I say that there was not knowledge enough in the United States to forge these inscriptions. There are other so-called Mound Builder inscriptions besides those for which I vouch from internal evidence, of which I say nothing.

writing of the two peoples should also coincide. It is easier to trace the resemblance between the Corean characters and those of the Mound Builders than to show the relation of the latter to the Aztec hieroglyphics. I say Aztec rather than Mexican, for with the inscriptions of Yucatan and Guatemala we have nothing to do. Yet I am convinced that the Mound Builder characters are the cursive form of the Aztec hieroglyphics. Thus, starting from hieroglyphics, I ended at the same, embracing the only two hieroglyphic systems, excepting the Egyptian, in existence. On close examination I found that the hieroglyphics of Mexico stand in a very definite and intimate relation to those of Syria, spite of the wide interval between them in space and time.[9] As the phonetic syllabic values of the Aztec characters are well known, I gained in them the actual key to the old Turanian syllabary. The values of the Aztec hieroglyphics I found to correspond in almost every case with those which, on the authority of the Cypriote and the Corean alphabets, I had affixed to the characters, Etruscan and otherwise, most resembling them. Thus, for example, the Cypriote shield-like character having the power *mo*, and the Corean parallelogram possessing the same value, coincide with the square or circle, which in Aztec denotes the number 10, *matlactli*, and which in composition is read *ma*.

Passing now westward from Corea, a vast written area appears in Siberia. M. Vl. Youferoff, of the Imperial Society of Geography at St. Petersburg, spared himself no trouble to furnish me with the principal inscriptions found in the Yenisei country. These, with variations, set forth the same Turanian syllabary, rather of the Corean and Cypriote order than of the Aztec and Hittite.[10] Nevertheless, a few hieroglyphic forms, common to Hittite and Aztec, prominent among which is the *fish*, appear in these intensely interesting monuments. They also claim kindred with those of the American Mound Builders, as much by the correspondence of written characters as by the rude representations of animals and human figures which they contain. Several of them deal with the reign of Sekata, the Sheketang of the Chinese historians, who virtually headed the Khitan dynasty of China.[11] Searching for traces of the writers of the Turanian character in the land of the Indian Cathaei, Dr. Emil Schlagintweit, of Munich, directed me to the Lat inscriptions of northern Hindostan. As I wrote the other day to Dr. Leitner, of Lahore, who is interested in my researches and has published my comparisons of inscriptions, it may seem presumptuous to ignore the labors of Prinsep, Cunningham, and Dowson in this field, who have acted on the supposition that the phonetic values of the Lat characters are those of corresponding early Sanscrit letters, and have published unsatisfactory translations of them.[12] Nevertheless, I am convinced that the Lat inscriptions are in the old Turanian syllabary, of which they are the most perfect specimens, as they are the first to exhibit the vowel notation which really makes them alphabetic like the Corean. The Corean vowel notation is the same virtually as that of the Lat inscriptions. To what extent the Aryan Indians borrowed the Turanian letters, or what phonetic uses they put them to, I am not yet in a position to say.

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[9] See plate.

[10] The Hittite and Aztec are hieroglyphic; the Cypriote and Corean, cursive or alphabetical or syllabic in form.

[11] The Khitan dynasty of China, coming from the west, took possession of Leaotong in the north east in 907, and extended their sway over the northern part of the empire. From the

So far, I have found no links to bind the Punjab with Syria in the chain of Turanian script. From Syria westward, various mem-

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Khitan was derived the mediaeval name Cathay. They were expelled in 1125 and their place taken by the Mantchu Nyuche. Klaproth, Asia Polyglotta, 194. Sheketang or Shekingtang, the second Emperor of this dynasty, ascended the throne in 936 A.D., under the name of Howtsin. Gutzlaff's Sketch of Chinese History, Vol. I., p. 338. It is said that the invaders came from the desert of Kobi, but it is more than a coincidence that in the region of Siberia about the head waters of the Yenisei, where most of the Siberian inscriptions have been found, the natives call themselves individually *ket*, *kit*, *khitt*, *hitt*, *hüt*, according to their different tribes, and that one important tribe in former days, of which but a remnant is found, is that of the Kotten. Malte Brun, Geography, in loc., says that the Tartars call the mounds of the Yenisei country to which the inscriptions belong Li Katei, which he translates, "the tombs of the Cathayans."

[12] The first great student of the ancient characters called Lat (because chiefly found upon the monuments so denominated) was Mr. James Prinsep, the author of Indian Antiquities. The chief present workers in the same field are Major-General Alexander Cunningham, C.S.I., Director-General of the Archæological Survey of India, in his elaborate and valuable reports, and Professor Dowson, in the Transactions of the Asiatic Society and elsewhere. I call the translations given by these scholarly men unsatisfactory, because many of them are incomplete and can only furnish a general signification, a few present unwieldy compounds like Chehhichchha, and others represent pillars which eastern royalty might have envied as the gifts of mendicant monks. In the third volume of General Cunningham's admirable reports of the Archæological Survey of India, Plate XVI., inscription D is read on p. 48 in the text as "the religious gift of Bodhi Varmma, a mendicant priest of Sakya, &c." I read it as an invitation of a Gupta King to his people to worship Gatama. The construction is Japanese and of course the vocabulary is of the same nature. The Lat characters are of inestimable value in Turanian palæography as they, by means of added lines and curves to the radical consonantal character, as in the Corean, give definite vowel values. A careful study of the Indian inscriptions and more accurate knowledge of Japanese will enable me to read with greater precision and definiteness the Siberian inscriptions which are next to them in chronological order. For the Siberian Khitts and Chinese Khitan were but expatriated Indian Cathæi.

bers of this family appear. Besides the unmistakably Hittite hieroglyphics in Asia Minor, I find the Phrygian and Lycian inscriptions, figured in the works of Texier and others, to be Turanian. The same error, which has hid the Etruscan from view, has made these unintelligible. As at present read, with Greek and Phœnician phonetic values, they have no relations with any known tongue; and we have no right to suppose any family of language lost.[13] The bilingual Lycian inscriptions afford much help in determining the values of the characters, which exhibit Indian analogies. Although the aboriginal populations of Greece, including Macedonia and Thrace, were Turanian, I am not aware of any inscriptions in the old Turanian letters between Asia Minor and Italy. But, in the latter peninsula, it may almost be assumed that inscriptions, which are not written in Greek or Roman, are in Turanian characters. Such, most certainly, is the case with the Etruscan remains. The Etruscan letters are reproduced in Spain in the so-called Celt-Iberian inscriptions, along with forms which recall the variations of Asia Minor and Hindostan. Of these, however, I have hardly made a study.[14] Nor are they the last specimens of old Turanian literature in the west. That supposed solitary example of Pictish writing in Scotland, the Newton Stone, an accurate copy of which I owe to the kindness of President Wilson of University College, is an aberrant, but easily recognizable, type of the same wide spread writing.[15] I have not had time nor opportunity to compare the forms presented in the Sinaitic inscriptions, and in the aboriginal alphabets of northern

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[13] As accessible to the general reader I refer to the samples of Phrygian and Lycian inscriptions contained in Professor Rawlinson's Herodotus, Appendix Book I, Essay XI., which will be found to bear out my statement. Indeed Professor Rawlinson in treating of the Lycians (12, vi.) note 8, says: "The roots, however, are for the most part curiously unlike those in any other Indo-European language." In the first Lycian inscription there given I read the middle word of the first line which has been rendered *erafazeya*, as *Sidara Parmene aur*, which is Basque for Sidara or Sidari, son of Parmene. Independently adapted from the old hieroglyphic system, which long lingered in Asia Minor, although generally on the model of the Greek alphabets, the cursive Hittite writing, while presenting everywhere many resemblances, also exhibits variations that call for careful study and comparison.

[14] Since this paper was submitted I have received from the Rev. Wentworth Webster, of Bechlenia, in the Basses Pyrénées, copies of Celtiberian inscriptions, which, with slight variations of a few characters and with one or two new words, one of which I have since found in the Cippus of Perusia, accord with the Etruscan. Two of them belong to the period of Roman occupation in Spain.

[15] Not only the Newton Stone, but many inscriptions hitherto read as the work and memorials of obscure Norsemen, are Pictish records, and establish beyond question the Iberic character of that early British population.

Africa. Neither have I yet been able to pay the full attention which I should like to give to Dr. Hyde Clarke's extensive researches in the field of ancient Turanian alphabets.[16] The inscribed whorls found by Dr. Schliemann at Hissarlik, to which he has recently been applying himself, are undeniably of the class under consideration.

From the foregoing statement, it will be seen that the chief materials for determining the phonetic values of the old Turanian characters are the Aztec hieroglyphics, the Corean alphabet, the Cypriote syllabary, and the bilingual inscriptions of Asia Minor. The Etruscan bilinguals have, so far, been a barrier in the way of progress.

THE LANGUAGE OF THE ETRUSCAN INSCRIPTIONS.

After transliterating the first twenty lines of one of the Eugubine tables, I found myself among Basque constructions. The forms of the auxiliary verbs *naiz* and *dut*, such as *bagare*, *guinela*, *balu*, *banuen*, are so peculiar and recur with such frequency, that, so far as my knowledge of languages goes, it is impossible to mistake the Basque for any other tongue.[17] The Basque vocabulary is otherwise common to a large family of languages, which I have in many papers dealt with under the name of Khitan. I am not aware that there is any tradition of an Italian origin among the Basques, save that noted by M. Francisque-Michel in *Le Pays Basque*, which makes the great chief Uchin the founder of Urbinum in Umbria.[18] Nothing, however, could be more probable than the unity or near relationship of the two southern Turanian peoples, the Etruscans and the Basques. The similarity of the Celt-Iberian and Etruscan alphabets is another point in its favour. The most convincing proof, however, is afforded in the Umbrio-Eugubine tables, where we read, in plain Roman letters, of the *trifor Tarsinater, Tuscer, Naharcer, Japuscer*, that is "the threefold Tyrseni, Tusci, Navarri, and Guipusci.[19]

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[16] Set forth from time to time in communications to the Athenaeum, Nature, &c. See Athenaeum, July 25th, 1885, p. 112, for the Hissarlik whorls.

[17] Bagare, modified indicative present, 1st plural, of the verb *naiz*, I am.

Paradigm.

banaiz, bahaiz, bada—if I am, thou art, he is.
bagare, bazarete, badire—we are, you are, they are.

Guinela, modified indicative past, 1st plural, of naiz.

Paradigm.

naincela, haincela, cela—(it is said) that I was, thou wast, he was.
guinela, cinetela, cirela—we were, you were, they were.

Balu, modified indicative past, 3rd sing., of the verb *dut*, I have.

Paradigm.

banu, bahu, balu—if I had, thou hadst, he had.
baguinu, bacinute, balute—we had, you had, they had.

Banuen, modified indicative past, 1st sing., of *dut*.

Paradigm.

banuen, bahuen, bazuen—(it is asked) if I had, thou hadst, he had.
baguinuen, bacinuten, bazuten—we had, you had, they had.

Lecluse, Manuel de la langue Basque, p. 59, 64. M. Lécluse gives five modified indicatives for each of the two auxiliaries. Of the five modifications of naiz, bagare belongs to the first and guinela to the fourth. Of those of dut, balu belongs to the first and banuen to the third.

In my articles on the Khitan languages, published in the Transactions of the Institute, in a paper read at the meeting of the American Association for the Advancement of Science at Minneapolis, and elsewhere, I have set forth the fact, that, various as are the grammatical forms of Basque, Caucasian, Yeniseian, Japanese, Corean, Iroquois, Choctaw, and Atzec, they are one in point of vocabulary, and constitute, with many other members, a linguistic family of no small importance. The parent speech belongs to Syria: West of Syria, in Asia Minor, Italy, Spain, and Britain, the inscriptions yield Basque. East of Syria, in India, Siberia, and on this continent, the Japanese at first, and afterwards the Aztec, are the languages set forth by them.[20] I have already shown how the Hittite name, Cetaei in the Troad, Cetii in Cilicia, Khíta in Syria, Cathaei in the Punjab, Khitt in Siberia, Khitan on the borders of China and Corea, and Citin in Mexico, shows the track of the foremost among northern migrating peoples. To the same race the Etruscans belonged.

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[18] Francisque-Michel, Le Pays Basque, p. 229.

[19] In this connection I may mention a remarkable book by Curzio Inghirami, who has generally been regarded as the Chatterton or Ireland of Italy. This youth found in an envelope of bitumen and other materials several documents written in Latin and Etruscan characters, setting forth the history and religious rites of the Etruscans, down to the time of Sylla. Pignotti, in his Storia della Toscana, regards the *Fragmenta prope Scornellum reperta* as a forgery, and gives cogent reasons for the opinion, although, on account of his youth, he exonerates Inghirami. The discovery of the documents was made in 1634. I have bestowed some attention upon the Fragmenta, and, judging them solely, of course, by the internal evidence, am not convinced of their spuriousness. One of the most remarkable and, in Inghirami's age, uncalled for statements in the book, is that which gives the Cethic or Hittite name to the aboriginal Etruscans who came with Vandimon and his son Japetus into Italy. To base anything at all upon the statement of a doubtful work would be unscientific in the extreme. I simply refer to it in the hope that Inghirami's treasure-trove may be subjected to a more searching analysis than has yet been made of the work.

[20] I refer more particularly to my articles on the Khitan Languages which appeared in the Transactions of the Institute, Vol. I., Fasciculus No. 4, 1883, p. 282, Vol. II., Fas. 2, 1884, p. 158. The coincidence of the Basque and Japanese vocabularies is set forth in many parts of this paper. The Aztec, as belonging to the same family, is useful in explaining the Mound Builders' written remains. Lat Indian, Siberian and ancient Japanese inscriptions are read in the Japanese.

The threefold Tyrseni, Tuscer, Naharcer, Japuscer, carry us back to Mesopotamia, the land of the Nairi or Naharina, and to the included region of Khupuscai, as well as forward to Navarre and Guipuzcoa. The former even take us to this continent, where the Aztecs or Citin also called themselves and their tongue Nahuatl or Navatl. Who the Tuscer were, it is harder to say, for the final *er* is a termination; otherwise the great Basque name Euskara would at once suggest itself in such a form as the Dioscurias of Colchis, now Iskurieh, near which Chapsoukes or modern Khupuscians and eastern Guipuzcoans dwell. In the East, Hamath is more prominent than the Mesopotamian Hittite names, whether we view it in the Himalayas, the Emodi montes of antiquity, or in Yamato, the mountain door, or native name of Japan.[21] It is possible, therefore, that radical differences in grammatical construction, resulting from independent culture and environment, may have characterized two distinct branches of the Hittite family prior to their great migrations, which began in the seventh century before Christ. Certain it is that the auxiliary forms of the Ibero-Etruscan inscriptions are not those of the Hittites in Asia.

Of the Etruscan words furnished by classical authors, many at once reveal their Basque character. *Lar* or *Lars*, as in Lars Porsenna, is the Basque *larri*, great. *Lucumo* is, as the Cippus of Perusia reveals, *al auka ma*, composed of *al* power, *auka* choice, and *ema* give, denoting an elected potentate. Varro informs us that *atrium*, the fore-door or porch, was an Etruscan word. It is the Basque *athari*, a porch. Hesychius gives *damnus* a horse, which in modern Basque is *zamari; ataison*, a vine, not so easily recognizable in *ardanza; aracos*, a hawk, which is probably *arrano*, the eagle; *falae*, mountains, which is *pilla*, a mound. Festus furnishes *nepos*, luxurious, in which we may detect the Basque *napur*, a glutton; *buris*, the ploughtail, which is either *buru*, the head, or *burdax*, the extremity; *subulo*, a flute-player, which exhibits the same form as

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[21] It has been suggested to me that too much is made of what may be a mere accidental similarity of name. It must be remembered, however, that the theory of chances is against the constant repetition of several names in a series; that the names appear in connection with cognate languages, modes of writing, and other confirmatory connections. To build any theory, which I have no desire to do in any case, upon verbal resemblances alone would be as unwise as it would be to overlook them in an inductive process for ascertaining fact.

chambolin, a player on the tambourine. The three words *hister*, *ludio*, an actor or player, and *ludus*, a play, appear to have been forms of *hitz*, speech, and *elhe*, discourse, similar to *elhatari*, a fine talker. There is no present form *hitztari*. *Laena*, a woollen cloak, contains the Basque *ille*, wool.[22] *Lanista*, which according to Isidore meant *carnifex* in Etruscan, is probably derived from *iltzen*, to kill. However, if it mean gladiator or warrior, it may connect with the Etruscan name for Hercules, which has been read *Hercur*, *Hericthse*, but which I read *Lanetu-chipido* and *Lanetu-uchimonone;* the essential word *Lanetu* being the Basque *lanthu*, to work, labour, in allusion doubtless to the labours of Hercules. *Aesar*, a god, should be *Aitor*, the divine hero of the Basques.[23] The name of Jupiter on the Etruscan pateræ, which has been read *Tina* or Tine, should be read *Gouk-*

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[22] From *ille* comes ilain, wool merchant. M. Van Eys suggests as its derivation *ille egin*, to make wool, not exactly the work of a wool merchant. But some such form as *ilain* may fitly have signified in ancient times "made of wool." Laena is one of the glosses furnished by Festus.

[23] Other glosses I submit with some hesitation. According to Hesychius, Boreas was *antas* in Etruscan. In Basque *ipar* is the north wind, and *aize* wind in general. There is a Basque verb *hant*, *hantu*, with the French signification enfler, but whether enfler is to be taken in the signification of blow as well as of puff and swell, I do not know. The Etruscan *arse verse* is made to mean *averte ignem*. The present Basque word for "couvrir le feu" is *izark*, of which the etymology seems unknown. Arse may be an old form of *errauts*, cinders, the first element in which is the verb *erre*, to burn; and *verse*, the original of *barreatu*, *barreatzen*, to disperse, scatter. The latter word is identical in meaning with the Japanese *barasu*. Agaletora, which Hesychius translates "child," I take to be not *puer*, but *infans*. The word does not exist, so far as I know, in modern Basque, but its constituents do. These are the verbal adjective *ichilla*, silent, and *tar*, now rarely used save as "suffixe de l'ethnique," as in Burgostarra, an inhabitant of Burgos. Yet it appears in *anai-tar*, fraternal, from *anai*, brother. Ichillatar would thus be the exact equivalent of the Latin *infans*. The Etruscan months, in the general character of their names, agree with those of the Basques. Velitanus or Velcitanus, March, may correspond with the Basque *epailla*, the initial *e* not being radical; Ampiles, May, is more like Ilbeltz, January; Aclus, June may survive in *baguilla*, the Basque name of that month, but is more like *hacilla*, November, or *ceceilla*, February. Coelius, September, has also a form like *cecilla*. Isaneus, July, is in Basque *uxtailla*; and Ermius, August, is more like *urria*, October. *Druna*, a gloss of Hesychius, is made equivalent to the Greek ἀρχή, which some Etruscologists have translated as the Latin *principium*, others as the English "sovereignty." I am disposed to render the Greek by the equally allowable "origin, source," and to find its equivalent in the Basque *iturri*, source, and *jatorri*, origin. Balteus, a sword-belt, one of Varro's glosses, is probably a compound of *ubal*, a strap or belt, *abal*, *habela*, a sling. M. Van Eys says: "Est-ce que *ubal* et *abal* ne seraient pas des variantes du même mot dont la signification primitive était courroie?" Initial vowels in Basque are not necessarily radical. See my paper on the Khitan Languages, Proceedings Canad. Inst., 1884, Vol. II., Fas. 2, p. 163, rule 2, a. Falandum (falando, *Deecke*), *coelum* cannot be the sky, which is *zeru* in Basque, but may denote the celestial powers or gods, and be a form of *Alindun*, he who has power or dominion. Alin instead of *al* appears in the Eugubine tables and on the cippus of Perusia as the word for dominion. Aldun, *puissant*, literally "who has power," is the modern Basque form. The initial *f* is thus, of course, unaccounted for. It is worthy of note that b, g, d and o, letters denied to the Etruscan alphabet, appear in these glosses.

ara, and *Goukane* or *Goukain.* The latter is an inversion of the Basque *Jaincoa*, the word for god.[24] The name of Juno, generally read as Thalna, is really *Morasa-kara;* the former part of the word being the same as the Latin *Murcia*, wrongly identified with Venus. But Cupid is a purely Etruscan word, for the form read Turia is really *Cupido aurra*, or the child Cupid. Maris Turan, so far from being the son of Venus, is really *miratu uno Cupido raka*, probably meaning look towards Cupid.[25] Venus is also an Etruscan word, which has been read Pelias, as her son's name has been read Castur.[26] The first is *Banesa aurra no*, of the son of Venus, and the second *uchirano Cupido*, the precise meaning of the first part of which is hard to determine, as *uchi* may be *utz*, *hitz*, and many other Basque words. The name read Menle, Menerva, Menrva, does indeed denote the goddess Minerva, but her Etruscan name was Mineka; for these words give *Mineka-sane*, *Mineka-netugira*, *Mineka-tugira.* The root *men*, power, is doubtless the chief element in the name. The Etruscan title of Vulcan has been read Sethlans. It should be *nonemosarakano* or *non ema su rakano.* The first three words mean *who gives fire.* I am in doubt as to the precise meaning of *rakano.* The accidental coincidences Hercur, Castur, Pelias, Menerva, have done much to confirm Etruscan students in the application of Roman values to the letters of Etruria, and, with the ingenious parallel drawn by M. Bréal between the Umbrian and Etruscan tables of the Eugubine inscriptions, threatened, for a time, to put an end to my own researches.

THE PHONETIC VALUES OF THE ETRUSCAN CHARACTERS.

The Etruscan syllabary,[27] as represented by the sepulchral inscriptions in Lanzi, is very poor, and it is still more so in the Eugubine

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[24] Jaincoa, jinko, jangoiko, is supposed to be derived from *jaun*, lord, master, and *goi-ko*, of the height. The Etruscan shows rather that the original was *goi jaun*, the high lord.

[25] This and the accompanying Etruscan names of divinities are taken from the so-called paterae, really bronze mirrors, found in Etruscan tombs. See Lanzi, Vol. II., table VI., *seq.*, and the Rev. Isaac Taylor's Etruscan Researches. The latter writer states that *maris* denotes boy, a child of the gods. Thus *maris Turan* means "the boy of Venus," and *maris Thalna*, "the boy of Juno." Now the words read *maris Turan*, I read *miratu uno Kupido raka*, which may be "this one looks towards Cupid."

[26] See Lanzi, Vol. II., Table VII., Plate 5, where in connection with the figures represented appear the words TVDIA and /ELIAS. The first has been read Turia, the second Polias. But the first is *Kupido aur*, and the second *Banesa aur no.* Also Plate 6 of the same Table has KASTVD, generally read Castur. It is *hitzrano Kupido.*

[27] See page 163.

Tables. It possesses no sign whatever to mark independently the short vowels. Indeed, it is doubtful if it has any vowel sign at all, for the simple perpendicular line, or Roman I, rather seems to represent an aspirate, and may give ha, he, hi, ho, hu. It is the Aztec *hui* or *ui*, a thorn. This vowel sign or aspirate syllable sometimes presents difficulty, by appearing with its duplicate II, for these two perpendicular lines or parallels denote the short sound of *t* or *d* in composition, te, ti, de, di, et, ed. In Aztec it is represented by *titlan* or *tlantli*, the teeth. In the Hittite inscriptions it is generally perpendicular, but, on the bilingual of Tarkutimme, it is horizontal. The aspirate syllable appears in composition with a character identical in its simple form with the Roman C, when the compound assumes the shape of K. The C is a weak sibilant, *chi*, *che*, *zi*, *ze*, *is*. The combination K gives *hitz*, *ots*, *uchi*. C is the Aztec *chichi*, which Brasseur de Bourbourg renders *poumons*, *mamelles*. It occurs frequently in the Hittite inscriptions, alone and in composition. The only other case of combination is in the form B, in which the aspirate or broad vowel is joined to the character resembling the figure 8.[28] This figure 8 is the Etruscan l in all its powers, la, le, li, lo, lu, al, el, il. With the prefixed I, in the form B, it seems to denote ol, ul. The Aztec has no hieroglyphic for l, but that for *tlalli*, a piece of ground, the Basque *lurra*, is identical in form with the older square form of 8, which is common in Etruscan inscriptions, and has generally been read as h. The Corean l is square or angular; that of Cyprus is identical with the Etruscan. The Etruscan has only one character for all the powers of *r*, which is hardly ever initial in Basque words. It is almost identical with the Roman A, but with rounded top, and has been thus read. In the Hittite monuments it presents a rounded form, at once giving the bow as its original The Aztec has no r, but, as I have shown in my article on the Aztec and its relations, the peculiar Mexican combination *tl* may represent an original r or l. The Aztec symbol coinciding is *tlaoitolli*, the bow, the Koriak *ratla*.[29] In the Lycian inscriptions this character wants one of its extremities, and assumes the form of the figure 4. The Etruscan has two forms for the powers of M. The long sounds, ma, mo, mu, are represented by a circle or O, which frequently has an intersecting line, or by a diamond or square. Etruscan scholars have taken this to represent the Greek theta. It is, as I have already indicated, the Aztec *matlactli*, denoting ten, but represented by a figured circle or square, which may have meant a shield originally. This is a very common Hittite emblem, and occurs in the many groups which I have read *mati*, king.[30] The feebler sound of M, mi, me, im, em, is represented by a character not unlike the Italic *m*, which has correctly been read as such.[31] This I have not found in Aztec. As a hieroglyphic it must have denoted a ridge of mountains, and the Basque *mendi*, a mountain, was probably its original. It is common in Hittite, and the Cypriote mi is in accordance with it. The Etruscan character which coincides in shape with the Roman M, has not the sound of that letter. Indeed, this has been discovered by Etruscan students from a comparison of texts, so that they have made it the same as S, with the power of the Roman s. But this character, set forth variously as M, S, Z, and a division sign set perpendicular, has the values, na, no, nu. In Aztec it has lost its broad sound, being the *ne* of *neitl*, an arm. As an arm, these sounds are frequently represented on the Hittite monuments. The Corean *n* has also a form more resembling the arm, which the Etruscan was compelled to modify, lest it should be mistaken for *sa*, etc. The Cypriote *ne* is identical with the Etruscan character which I have compared to a perpendicular division sign. It was probably of phallic origin. Though common in Hittite, it is of rare occurrence in Etruscan. To denote the weaker powers of N, ne, ni, en, in, the Etruscans employed a symbol identical in form with the Roman E. For this I have no Aztec equivalent, and, although it appears in Asia Minor, India, and elsewhere,

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[28] In the Cippus of Perusia this form, which is common in the Eugubine Tables, is replaced by the horizontally intersected parallelogram, read by Etruscologists as *h*. Generally the latter character and 8 appear to denote the same sounds and to belong to different stages of the written language. But the Cippus shows beyond doubt that the angular form was reserved for *l* preceded by a long vowel. In B, the combination I8 appears, the perpendicular line representing the long vowel.

[29] I compare the Aztec with the Koriak of eastern Siberia as the resemblance between the Koriaks, Tchuktchis and Kamtchadales on the one hand and the American Indians on the other

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has often been pointed out, and as the vocabularies of these Siberian tribes coincide with the Aztec. See a few examples in my paper on the Aztec and its connections, already referred to.

[30] In the Hittite inscriptions. See a brief essay entitled "A translation of the principal Hittite inscriptions yet published." For the inscriptions themselves see Transac. Soc'y Bib. Archaeol., Vol. VII., Part III., p. 429 seq. The word *mati* king frequently occurs in the inscriptions, and is represented by a shield-like oval on its side, bisected perpendicularly by three lines, followed by a representation of a basket.

[31] This character does not belong to the Chalcidian Greek alphabet, nor does it occur in any Latin or other Italic inscriptions, save the Umbrian, Oscan and Faliscan, which are almost identical with the Etruscan.

its phonetic value is a matter of inference, so far as I remember. The majority of values being given, it is of course not difficult to infer the value of the unknown.[31a]

Passing from the liquid to the dental combinations, the Etruscan presents us with three forms for ta, to, tu, da, do, du, resembling the Roman D and P, and the Italic b. In the sepulchral inscriptions these seem to be interchangeable, but, in the Eugubine tables, I imagine that I have detected differences, the D generally standing for *tu*, and the b for *da*. This variable sign was, I think, originally an animal head, in Aztec *tochtli*, the rabbit, but in Hittite a gazelle. It is thus the first character in the Hittite legend of Tarkutimme. The weak powers of T and D I have already indicated. The labials are two, or, at most, three in number. B, P, V, with a, o, and u, are represented by a perpendicular line, from the top of which falls, at an angle of 30° or more, a line, generally of half the length, but sometimes continued farther. It may be represented by the figure 1 with a down stroke. This is the Aztec *pil*, *chose suspendue*, according to Brasseur. It is read as *p* by Etruscan students. The same consonants, with e and i, are represented by a form identical with the Roman V. This, by a strange inversion, is a vase or cup, the Aztec *palli*, which Brasseur holds to mean *couleur noire*.[32] As I have shown in my article on the Aztec and its Relations, *palli*, like the Japanese *biru*, also means "that which holds or contains." The Cypriote *pa*, like that of the Siberian inscriptions, is represented by two *v*'s, one above the other. The Corean *p* is a square *v*. There is, perhaps, an F in Etruscan, having the same form as the Roman, but it is hard to separate it from the form for *gi*, which, with other gutturals, demands attention.

The sounds ag, eg, ig, ge, gi, are expressed by a character resembling the Hebrew *beth*, or a Roman E, without the tongue or central short horizontal line. As the basal line of this character is frequently drawn across the perpendicular, it is sometimes hard to distinguish it from F. Where more squarely cut, there is the same danger of confounding it with C, as prevails in the case of C and G in Roman inscriptions. I am in doubt as to the corresponding Aztec hieroglyphic, but think it is either *camatl*, the mouth, or *quauhtli*, the eagle.[32a] The latter supposition may be justified from the Hittite, in which the eagle represents the *ke* or *ge* of Karkemish. In Corean, *kh* agrees, being in the shape of the Roman F. It has conveniently been read in Etruscan as *v* or *z*, according to the exigencies of the interpreter. The sounds *ka* and *ga* are represented in Etruscan by a character, generally read *n*, varying in appearance in different texts as the Roman N and H, and the Hebrew *cheth*.[33] Its original is the Aztec *calli*, a house, with the shape of which the Hittite hieroglyphic corresponds closely. In the cursive Hittite, or that in which the hieroglyphic begins to fade away, it appears in form something like the Italic *h*, or a child's rude drawing of a chair. It is wanting in Corean, and, so far as I know, in Cypriote, unless the twisted *ko* of the latter syllabary be its equivalent; but it is common in Asia Minor,[34] in the form of an old Greek or Phœnician *n*. In the Lat, Siberian, and Mound Builder inscriptions, the same character assumes the Etruscan and cursive Hittite forms. The most frequently recurring guttural sign is one which generally appears as a Roman Y, one of the forks of which is carried across the perpendicular. At other times, it has the perfect form of Y, and, at others again, it becomes a cross or a T. A comparison of texts at once demonstrates that these are variants of one sign, and, on this account, Etruscan students have uniformly read it as *t*. It really denotes ko, go, ku, gu. Its Aztec representative is *quahuitl*, a tree. Its tree form is recognizable in the Hittite inscriptions, and, in its Y equivalent, it constitutes the radical element in the Cypriote *ku*.[35]

[31a] I have since found the original of this character in Hittite and in Cypriote. See plate.

[32] Brasseur de Bourbourg, Histoire des Nations Civilisées du Mexique, &c., Tome 1, Introduction, p. LIV. My friendly critic complains of obscurity in the text. The *inversion* is that which gives in Aztec the sound *pa* to the equivalent of V and the sound *pi* to the equivalent of Λ. As I read these Etruscan characters, V is *be*, *bi*, *pe*, *pi* and Λ *ba*, *bo*, *bu*, *pa*, *po*, *pu*. While the preponderance of evidence furnished by Hittite, Lat Indian, Siberian and Etrurian inscriptions is, I think, in favour of the renderings I have given, there is much that tells in the direction of the Aztec equivalents. I leave it therefore an open question whether V should be *ba*, &c., and Λ, *be*, &c. But this must not be decided hastily, for we cannot tell what changes vowel sounds have undergone in a group of languages yet unclassified, and for which no laws have been formulated, save the few set forth by me in the Khitan essays.

[32a] It may seem improbable at first sight that F should in any way represent an eagle, but a comparison of the original form of the character with that of the Hebrew *gimel*, derived from a camel, will show analogous changes.

[33] The angular *N*, like the *M* referred to in note 31 above, occurs in no Latin or Greek alphabet.

[34] Lycian and Phrygian.

[35] The lack of appropriate type compels me to make references which to the general reader must be more or less obscure. The Cypriote sign for *ku* is a Saint Andrew's cross, through the intersecting lines of which a Y is drawn perpendicularly. The cross with other lines, horizontal or perpendicular, is the Cypriote vowel symbol *a, e, i*. The Y is thus the radical element in the form for *ku*.

Still another guttural sign, which at times replaces equally *ka* and *ko*, or the house and the tree, is one which resembles an arrow pointing downwards, or an anchor with the flukes pointing upwards. This, doubtless, is but another form of the tree, or of a plant, the so-called flukes representing the branches or lower leaves. This does not agree with the Cypriote, for in that syllabary the phonetic value assigned to the same character is *te*. It is, however, one of the tree or plant forms in Hittite, and occurs abundantly in India and Siberia. In the famous edict of Asoka, it constitutes the last character in that monarch's name.[36]

The sibilants only remain. Two of these, in the forms C and K, I have already set forth when dealing with the aspirate I. The broad powers of S, *i.e.*, sa, za, as, so, su, are represented by a single character, generally read *l* from its resemblance to that Roman letter. However, the lower limb of the Etruscan character is not horizontal, but stands in the same relation to the perpendicular that the upper limb does to that of the character *ba*, *pa*. I can think of no sign exactly corresponding to it, although the radical sign in arithmetic comes near it. In the Indian inscriptions, the same values are represented by the perpendicular sign in geometry. Its Aztec equivalent is *xotl* a foot. In Hittite it has the shape of a foot or a carpenter's square. In Corean, the lower limb leaves the perpendicular above the base and slants downward, still preserving the idea of a foot. The upward slope of the Etruscan may be a reminiscence of the up-turned toe of the characteristic Hittite boot. The last character calling for mention is one which combines the one just considered with the Y-like *ko*. It consists of a perpendicular, touched or traversed by two equidistant lines at an angle of 30° or more, according to the fancy of the artist. It may roughly be represented by a double dagger, and appears to have the phonetic value *itch*, *ich*, *itz*. It may, therefore, be the Aztec *itztli*, a dart. In Hittite, a single dagger probably represents the same. The Cypriote *si* shows some resemblance to this character, but its value is attested by the Corean signs for *ts*, *dz*, which are combinations of *k* and *s*. Such then is the meagre Etruscan syllabary, and such its derivation. I might, perhaps, have gained more attention and credit for its decipherment, had I, as might easily be done, left the distant Aztec out of sight. This, however, would have been to sacrifice, to a dogmatic dictum of "antecedent improbability," common gratitude. love of truth, and really scientific principle. Everything is antecedently improbable in the region of the unsolved, otherwise the unsolved would not exist.

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[36] Asoka, King of Cashmere, is spoken of in the Raja Tarangini or History of the Kings of Cashmere, book I. sl. 101 seq., as the first royal convert to the faith of Buddha. See Troyer, Radja Tarangini, Tome II in loc. cit. also p. 406 seq.; and for reference to the inscriptions p. 413. Facsimiles of some of the inscriptions are found in the Journal of the Royal Asiatic Society. The name of the author of the inscriptions has been read as Piyadasi, whom Indian scholars have identified with Asoka. I read the author's name, which occurs frequently, but not in the characters read Piyadasi, as Asoka. But I find no mention of Antiochus, Ptolemy, and Magas, whose names are said to appear in these proclamations.

To the names of those already mentioned who have materially aided me in the work of decipherment, I should add my acknowledgments to W. Harry Rylands, Esq., Secretary of the Society of Biblical Archæology; M. Léon de Rosny, President of the Institution Ethnographique of Paris; W. H. Vander Smissen, Esq., Librarian of the University of Toronto; Hyde Clarke, Esq., Vice-President of the Anthropological Institute; the Rev. George Coull, A.M.; my colleague, the Rev. Professor Coussirat; and last, but not least, to J. C. Robertson, Esq, B.A., Classical Fellow in University College, Toronto, for his kind care in revising the proof-sheets of this paper.

THE ETRUSCAN SEPULCHRAL INSCRIPTIONS.

The Rev. Isaac Taylor and other Etruscologists, while failing to translate these inscriptions, have made some good guesses. Such are their suppositions that the characters they have read ISA denote a wife, those read SEC, a daughter, and those read AL, a child. If, according to their own method, they had read SA, EC, and NAL, they would have been more correct. The first is *nare* or *anre*, wife; the second *nechi*, now *nesca*, daughter; and the third *karasa*, or in modern Basque, *sortze*, natus.[37] Other terms of relationship are *uta* and *babe* father, and *uga* or *uga anre* mother or lady mother, sometimes also rendered by *amona* and *amona-anre*. *Uta* is the present Basque *aita*. *Babe* only survives in the language of children. *Uga*, though common in composition in modern Basque, has ceased to designate a mother, but *amona* and *amandria* remain. For child, the common word is *ura*, the modern *aurra* ; for a little child, some compound of *chipi*, which still means little. Daughter is more often *albi* or *albisa* than *nechi*. These forms are now *alaba* and *alapichi*. The commonest words for brother and sister are *noba*, now *nebia*, and *arreba* or *arba*, which is unchanged. The word *bau* or *bahi*, which means a pledge, seems to denote husband or wife. Child is sometimes rendered *ume* or *hume*, the unaltered form. As read formerly, *uta* would be IR ; *babe*, PU ; *uga*, IN ; *uganre*, INSA ; *amona*, THE ; *amona anre*, THESA ; *ura*, IA ; *chipi*, CU ; *albi*, *albisa*, HU, HUL ; *noba*, SP ; *arreba*, AP ; *bahi*, PI ; and *hume*, IM. They were brave men, if not over-wise, who led a forlorn hope against such a formidable array of darkness.

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[37] It has been objected that *karasa* and *sortze* are difficult to reconcile. That NAL, *karasa* means "natus," several bilinguals attest. The Basque "natus" is *sortze*. The only difficulty in the word is the replacement of *ka* by *so* after an interval of over a thousand years in the history of the language. See Van Eys, Dictionnaire Basque-Francais, Introduction, p. XLIII. Tableau des permutations des consonnes dans les mots basques de différents dialectes. K = S, Z, Ch. Karamitcha = zaramika; kirten = zirtoin; kiskaldu = chichkaldu; gale = zale; gapar = zapar; itogin = itozin. For change of vowel see in the same dictionary, khurruka, khurulla derived from karraka; garratz = kirats, kharax; galde = galdo; marruskatu = murruskatu; salhutzea = zaulitzea; chokon = zokon; elkar = elkor; etzin = etzan; ala, halatan = hola, holatan. The Japanese equivalent of the Basque *sortze* is *haramu*. One class of Japanese verbs derived from nouns is formed by adding *mu* to the noun; thus from *hara*, belly comes *hara-mu* to be with child. In the same way but with a different verb-former *tu*, *tsu*,

Etruscan inscriptions are, with few exceptions, written from right to left. For convenience sake I invert the text where it is introduced, and the direction of the individual characters. For lack of Etruscan type, I am compelled to represent these characters by the nearest equivalents which an ordinary English font supplies. A reference to the descriptions under the heading "The Phonetic Values of the Etruscan Characters," will enable the student to identify these equivalents with the original forms in Lanzi's Saggio. The following, in the order of the English alphabet, are the Etruscan symbols with their varying phonetic powers. Aberrant forms are grouped with the English letters they most resemble.

A = ra, re, ri, ro, ru ; ar, er, ir. Examples : AS rano, YA gure, LA zari, AO roma, AD artu. When *r* is preceded by a long vowel, *o* or *u* (*or*, *ur*), it is generally rendered by I A.

B = ol, ul, hal, hel, hil, hol, hul. The same character is the horizontally bisected parallelogram, now read as *h*. It is a compound of I and the following character. Example : BE alne ahalne, BD olatu.

8 = la, le, li, lo, lu, al, el, il. Examples : 8ED lanetu, 8IS leheno, 8V albe.

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the Basque *zorro*, ventre, becomes *sortu*, *sortzen*. The Japanese *shiroi*, white in the same way forms *shiromu*, to become white. The corresponding Basque *zuri*, *churi*, white, by adding *tu*, *tzen* forms *churitu*, *churitzen*, become white, whitens. Such instances might be multiplied indefinitely.

C = chi, che, si, se, zi, ze. Examples: CV chipi, CAE ziren, CA zeru.

D, P, b = to, tu, do, du; but in many cases in the Eugubine tables these three characters represent every power of *d* and *t*. Much as I would like to attach definite values to each of them, my knowledge of the relation in which ancient Basque or Etruscan stands to modern Basque phonetically, is not such at present as to justify me in so doing. See also II.

E = ne, ni, en, in. Examples: YE gune, ED entu.

F = ag, eg, ig, gi, ge, but never ga. FE agin, egin, VF begi, FA igar. It is possible that begi was originally be-ig.

H, N = ka, ga generally, but was probably used also for ak, ke, ki, ge, gi. Examples: HV gabe, NA kari, now ekarri; also NED now kendu.

I = ha, he, hi, ho, hu, au, ai, ou, eu, oi, ō, ū, hau. Examples: IA hiri, aura, ōra. The poverty of the Etruscan syllabary multiplies the equivocal to such an extent that the context or even a knowledge of the nature of the document in which such words occur must decide their value.

II = ta, te, ti, da, de, di, at, et, it, ad, ed, id. See above D, P, b. This sign is never used for to, tu, do, du. As for ot and ut, od and ud, they are represented by IP, Ib. Examples of II are OII emat, IIV debe.

K = os, ots, oz, otz, us, uts, uz, utz, hatz, hitz, hez, hots, huts. It is a compound of I and C. In the inscriptions of Asia read by Japanese it gives ochi, uchi. As representing two syllables, instead of the forms indicated, it frequently, indeed generally, should be read osi, utsi, oze, but never osa, otso, utsu. Examples: K hitz, KV oṡpe, VKE behatzen, KDE utziten.

L = sa, so, su, za, zo, zu, as, az, sometimes es, ez, but not os, us. It may also denote cho, chu, cha, and ja, jo, ju, when these sounds pertain to the sibilant series. Examples: LA zari, sari, L su, so, LV azpi.

m = me, mi, em, im. Examples: *m*A mira, *m*E imini. See O.

M. See S.

O = ma, mo, mu, am, om, um. Sometimes it represents what is now in Basque *em* followed by a broad vowel, *eman*, which may originally have been OE mane. There are variant forms of this character, with perpendicular and horizontal intersecting lines, and with crosses contained within them, in some Etruscan, and in the Celtiberian inscriptions. In Celtiberian, O with a dot in the centre represents the Etruscan *m*. I have not determined with exactness enough for dogmatism the different vowel values and positions indicated by the other forms. Examples: AO roma, OA umra, (Umbra) OV ambe, VO pimo.

R. I do not recognize this as a character *per se*. It is a variant of P.

S. Z. M. = na, no, nu, an, on, un. The two last, *on* and *un*, when initial at least, are generally represented by IE, IS, one, uno. But the character M seems specially to indicate these sounds, when the initial vowel or aspirate character is dispensed with. However, M is very often interchangeable with S. The Z is simply a variant of S, and, as far as I can judge, marks a different class of writings, differing chronologically or geographically. Examples: AS rano, ES nioñ, SI anai, MPAN ondoreak.

T. See Y.

V = be, bi, pe, pi, eb, ib, ep, ip. Examples: VF begi, LV azpi, V8 ibil, YV kube, now jabe.

Y. T. = ko, ku, go, gu. I do not think that originally it represented any other sounds than these. There can be no doubt that YV kupi, kube, kobe, is the same word as the modern Basque *jabe*, *jaube*, lord, but it is better to regard *jabe* as a corruption of *kobe*, than to enlarge the powers of Y. When j and ch represent original gutturals, the words in which these letters occur may be looked for under Y, N, ⊥ and F. When they represent original sibilants, they should be found under C, L and ‡.

⊥ = go. This character, as I have indicated, is nowhere to be found in the Eugubine Tables. It was thus not an essential part of the Etruscan syllabary. I have also shewn that its hieroglyphic origin is the same as that of Y. In the majority of instances in which I have met with it in the inscriptions, it has simply replaced Y, with the value go. But in other exceptional instances it has appeared with Y in the form ⊥Y, and there have been instances in which from analogy

NY, kako, kago, gago, the present gogo, mind, desire, would be expected. This inconsistency I can for the present only state, not explain.

‡ = ech, etch, ich, itch, certainly, and probably ets, its, etz, itz. Examples: ‡VCI ichpichio, ‡I etsai.

·|· same as S. This form, rare in Etruscan, but common in Hittite and Cypriote, occurs in Lanzi No. 419, vol. II., p. 376, for SA anra, now andre.

λ Λ = ba, bo, bu, pa, po, pu, ab, ap. Ob and up are rendered by Iλ. The second character appears in the Eugubine Tables. Examples: λED banetu, λV babe, λAYDE borokutune, now borrokatzen.[38]

There are other Etruscan characters than those I have indicated the powers of, but their signification is not essential to a knowledge of the inscriptions in general, nor is it wise at this early stage of Etruscan study to obtrude that which is less important. I do not

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[38] Mr. VanderSmissen calls my attention to an Etruscan syllabary and alphabet upon a *lecythus*, found at Caere, represented in the collection of Fabretti. The syllabary I cannot reproduce in full without an engraving which at this stage is unnecessary. The following sample sufficiently indicates its character:—

				Read by Lepsius:			
ʃ I	ʃ A	ʃ Y	ʃ E	bi	ba	bu	be
λ I	λ A	λ Y	λ E	gi	ga	gu	ge
I I	I A	I Y	I E	zi	za	zu	ze
8 I	8 A	8 Y	8 E	hi	ha	hu	he
O I	O A	O Y	O E	di	da	du	de
m I	m A	m Y	m E	mi	ma	mu	me
M I	M A	M Y	M E	ni	na	nu	ne
P I	P A	P Y	P E	pi	pa	pu	pe
*	*	*	*	*	*	*	*
T I	T A	T Y	T E	ti	ta	tu	te

First I call attention to the fact that the illustrious Lepsius has given values to the characters λ, O, M, P, which are at variance with those given by the present school of Etruscologists. They make λ = p, O = th, M = s, and P = r. I think, however, that he is right in reading Y as V.

The alphabet, as nearly as type will represent it, is as follows:

ABCDEFI8OIKL(m)M□OPNPΣTYTO⅃

The 8 is square; the first O is traversed by a horizontal line; the □ contains a cross; the second O has a central dot; the N has a shortened left limb as in old Greek; the second T carries the perpendicular line above the diagonal line; and the Ⅎ is more like the Greek Ψ.

If the alphabet is Etruscan, D is r according to present readings, and so are the two P's; also the variant T's are read with the same powers, as are the two *s* forms M and Σ. It is also to be noted that the supposed alphabet and syllabary are not accordant.

Some light may be shed upon this succession of characters by comparing it with another supposed alphabet figured in Dennis's Cities of Etruria, and readily accessible in Browne's History of Roman Classical Literature. The author says: "One example of the Etruscan profess to exhaust the syllabary or any department of Etruscan philology, but to communicate what I know to those who with more abundant leisure and facilities may be able to reduce to scientific exactness of proportion the stones of a new edifice, which with

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alphabet is extant. It was discovered in a tomb at Bomarzo by Mr. Dennis, inscribed round the foot of a cup, and probably had been a present for a child. The letters ran from left to right, and are as follows":—

8ꓕOVYΣDM \NmLIOB3FECA

Reversing this we obtain:

ACEF3BOILmN /ΛMDΣYVOꓕ8

Here, also, B represents square 8; the N is similar to that of the preceding alphabet; the T carries the perpendicular beyond the horizontal or diagonal; the ꓕ is like the Greek Ψ; and the F is inverted. There is also a new character something like the figure 3.

The correspondences are:

Caere. ABCDEFI8OIKL(m)M□OPNPΣTVTOꓕ
Bomarzo. A-C-EF3BOI-L m DΣYV
N /ΛM Oꓕ8

I confess that ABCDEF in succession might easily carry conviction to the mind even of the critical student that the powers of the Etruscan alphabet were those of the Latin. I therefore ask the reader to return to this note after having studied the inscriptions in the text. Mr. VanderSmissen suggests the likelihood of the Etruscans in the later period of their history adopting the Greek and Roman alphabets and a complete vowel system. Of this, however, I have no evidence. I incline rather to the belief that they did not adopt the Roman alphabet until they adopted the Latin language. The monuments plainly indicate that the Etruscan scribes assimilated the forms of their characters to those of the Roman letters, but without in the least affecting their phonetic values. As for the order of writing it is just possible that inscriptions reading from right to left may have been modelled on the Roman. But the various inscriptions which I have classed with the Etruscan, namely, Celtiberian, Pictish, Phrygian, Hittite, Indian, Siberian, &c., exhibit little consistency of order, reading generally indeed from right to left, but often from left to right and boustrophedon.

To return to the supposed alphabets, I read that of Bomarzo thus:

A C E F 3 B OI L m N /ΛM D Σ Y V O ꓕ 8
er ze in ag ti la mai su mi ka bano ta ne ku be ma go la
Basque: erre zein gatillu mai su imi ka bana tanka bu makilla
burn who vase tablet fire placing by within strike let the stick
Let the stick strike him who burns the tablet (inscription) of the vase by putting fire into it.

Here it will be observed that I read 3 as if it were ǁ. This I do on the authority chiefly of the Siberian inscriptions, which use ɥ, } }, } and 3 for ti, te, &c. The corresponding Caere character is I. The only word which is not modern Basque is *bana*, and this I take to be a form of *barrena*, within. M. Van Eys derives *tanka*, *tankatu* from the Provencal *tancar*. It cannot, however, be other than the Japanese *tataku*, the Choctaw *timik-lih*, the Iroquois *tekkentoks*, and the Aztec *tzotzona*, all meaning to beat, strike, thump, knock. Although *mai* now means a table, it must originally have designated a space upon any object on which subjects might be portrayed or characters written. The Japanese *hi-mei* denotes an inscription on a monument.

The Caere alphabet is:

ABCDEFI8OIKLmM□OPNPΣTVTOꓕ
ir aul zi dune ge te la mai utz su mi no ma mi ta ka ta ne ku be ku mago

clumsy tools borrowed from many distant lands I have rough-hewn out of the Etruscan quarries. The syllabary presented is far from an ideal one, but it is certainly as perfect as that of the ancient Phœnicians, who ignored vowels altogether, and hardly inferior to the Hebrew syllabary, prior to the invention of the vowel points within the Christian era.[39]

Basque: iraulzi duen gatillu mai * su imi * * * * * tanka bu * * *
overturn who does vase tablet * * fire place * * * * * strike let * * *

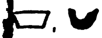
I have not hazarded a complete translation of this corresponding inscription. The K *utz* may be an Etruscan form of *or*, which is now *edo*. The final *kumago* shows the same root as *magola*, which Van Eys (subst. *makilla*) supposes to be *maka*, *makatu*, strike. Such a Malay-Polynesian form as *ku-mago* is hardly in accordance with Basque structure. Nor can I suggest at present an explanation of *no mamitu ka*. The Basque has a verb *mamitu*, to curdle, and another, *mamutu*, to disguise one's self in hideous fashion, derived from *mamu*, a spectre or hobgoblin to frighten children with. The Japanese *momonjii* has the same meaning as *mamu*. Can these words connect with the oriental Mamitu, goddess of fate, in the Izdubar legends (G. Smith: The Chaldæan Account of Genesis)?

The supposed syllabary I do not regard as such, but as an ingenious combination of characters on a consistent plan, setting forth words of two syllables, which are not only individually significant, but which may also have formed complete sentences in combination. The Basque roots are largely dissyllabic, so that the parent Etruscan may have been a biliteral language. The first character in the supposed syllabary is not *b*, but the replacer of V, be, bi, pe, pi. It occurs in this hooked form in the Hittite inscriptions and in Asia Minor. In ſ I ſ A ſ V ſ E we may find *behi* cow; *bera*, *bere*, *bero*, the first signifying equally tender and below, the second, his, her, its, and the third, hot, heat; *bebe*, probably an old form of one of the auxiliaries; and *bein*, once.

ʌIʌAʌVʌE bai, bahi; barru, buru, baru, borra; babe, pabe; bane. Bai has the double meaning "yes" and "spot," *bahi* is a pledge. Barru means "within," *buru*, head, *baru*, fasting, and *borra*, mallet; *babe* is the Etruscan for "father," and *pabe* is Basque help, support; *bane* is Etruscan join, unite. TITATVTE koi gare jabe gune in modern Basque, but in Etruscan gui gure gube gune. This reads correctly "we are desiring the place of the master." Similarly we might read 8I8A8V8E as lohi lara labe lane, and make Basque of it as *lohilla ra labe lan*, towards January the oven works. I do not profess to have read any of these lines, but that they can be read consistently I have little doubt. Corresponding rhyming fragments, but not so perfect in their structure as the one under consideration, are to be found in the nursery lore of all civilized peoples. The reason why final *i*, *ra*, *be* and *ne* were chosen for the composition of the piece is that being postpositions they would fit into the mosaic more perfectly than other syllables. Final *i* is hardly a postposition, but a sign of the dative case.

[39] The poverty of the Etruscan syllabary is by no means without parallel. When the Semitic peoples replaced a cumbrous hieroglyphic system by what are now known as alphabets, they really adopted syllabaries as bare as that of the Etruscans. The Hebrews had only one purely vowel character, namely *aleph*, and although they had expedients for representing long vowel sounds they were very frequently omitted. Thus, as Gesenius states, one form might be read *qatal*, *qatel*, *qatol*, *q'tol*, *qotel*, *qittel*, *qattel*, *quttal*. According to the same authority: "the Phœnicians did not even indicate the long vowels, except in very rare cases; their oldest monuments can hardly be said to have any designation of vowels." The Mongolian and Buriatic syllabaries present similar deficiencies, the same sign representing different sounds, and words quite distinct in meaning and pronunciation being written with the same characters: see Encyc. Brit., Article Mongols. The Javanese, Batak, Tagala, and other syllabaries of the Malay Archipelago are equally defective: see Crawford's Indian Archipelago, Vol. II., pp. 70-71. The alphabet of the Tuaricks of Africa is really a syllabary having no characters whatever to

COMPA OF KNOWN PHONETIC VALUES.

		Aztec Hieroglyphics.	
A	ra, re, ri, ro		tla = ra : tlaoitolli, a bow
8	la, le, li, lo,		tla = la : tlalli, earth
B ⊟	hal, hel,	aret	
C <	che, chi,		chi : chichitl, lungs, breasts
D.P.b.R			to : tochtli, the rabbit (animal's head)
ll.I.3	te,		ti : titlan, but from totlan, tlantli, tooth
E.F	ne, ni, e	aret	
F.L.F	ag,	aret	
H.N.N	ka,		ka : calli, a house
I	o, u, ha, he,		ui, hui, uh : hui, a thorn
K	ochi, uchi,	aret	
⅃.L	, sa, so,		so, cho : xotl, a foot, pronounced shotl
M	, me, mi,	aret	
M.S.Σ	na,		ne : neitl, an arm
O.◇.□	m		ma : matlactli, 10
V.Ꝭ	be, bi,		pa : palli, black (rather, contents)
Y.X.+.T	, ko		ka : quahuitl, a tree
·I·	na, no, nu,	aret	
↓.Ψ	ka, g		other form of quahuitl
‡.V	, et		itz : itztli, dart
/.∩	, ba		pi : pilli, something suspended.

SEPULCHRAL INSCRIPTIONS.

(The numbers refer to those in Lanzi's Saggio.)

41. OANA · ZEIANYI · LAYINIAL

Transliterated—ma ra ka ra · no ne u ra ka ku u · sa ra ku u ka u ra sa
Basque—marakara non orogogoi Saraku uga au eritza
Translation—monument where in memory Saraku mother his esteems
Freely—the monument in which Saraku honours his mother's memory

The first word *marakara*, which has been read Thana and made a proper name, occurs in a great many inscriptions, generally as the first word.[40] Sometimes it is replaced by *marakaku* or *maragogo*,

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denote vowel sounds: see Latham's Varieties of Man, pp. 523 and 566. It is important to keep in mind what Professor Max Müller says in his Sanskrit Grammar for Beginners: "To admit the independent invention of a native Indian alphabet is impossible. Alphabets were never invented in the usual sense of that word. They were formed gradually, and purely phonetic alphabets always point back to earlier, syllabic or ideographic, stages." The first stage of every system of writing was the hieroglyphic, which may have been purely ideographic like the Chinese. That the latter was the case, however, there is not sufficient evidence to decide. The oldest Egyptian hieroglyphics are syllabic and alphabetic as well as ideographic. So the oldest cuneiform writing was syllabic as well as ideographic. The Hittite hieroglyphics were syllabic, and but rarely ideographic. The hieroglyphics of Mexico were used ideographically, but also with syllabic values, for the Pater Noster, and other prayers and religious formulas were written in them by missionaries for the use of native converts. M. Léon de Rosny in an article on Les Sources de l'Histoire Anté-Colombienne du Nouveau Monde, in the Revue Orientale et Américaine, says: "Malgré son extrême défectuosité, les missionaires catholiques chargés d'évangéliser les Aztèques, le trouvèrent suffisant pour composer des livres religieux à l'usage des Indiens convertis. Les bons missionaires espagnols allaient même jusqu'à écrire de la façon le texte latin des prières qu'ils voulaient enseigner à leurs néophytes."

The next stage was that of reducing the number of signs within the smallest possible compass and simplifying their forms for the sake of rapid expression. This gave the Semitic alphabets, from which the European were derived. These, as has been shown, were really syllabaries with little or no representation of vowel sounds. In course of time the inconvenience of such a mode of writing became apparent to Cadmus or whoever introduced the Greek alphabet. By setting apart certain signs to denote vowel sounds, such as *aleph*, *he*, *yodh* and *ayin*, he turned a syllabary into an alphabet. This the Semitic peoples afterwards effected by added vowel-points or lines, of which, perhaps, the most perfect system is the Ethiopic. The syllabary derived from the Hittite hieroglyphics was perfected in a similar way in India by added lines and curves, a comparison of which with the vowel indicators of Corea at once attests the common origin of the old Indian and Corean systems of writing. The western Khitan syllabaries of Asia Minor, Etruria, Spain and Britain show little or no trace of having arrived at this third or perfect stage. For the old Indian alphabet, see Prinsep's Indian Antiquities, and for the Corean, the atlas accompanying Klaproth's San Kokf Tsou Ran To Sets. There are curious analogies between these systems and that of the Ethiopic syllabary.

[40] I am also indebted to Mr. VanderSmissen for the suggestion that OANA needs explanation in connection with the THANA which appears in corresponding positions on other Etruscan monuments. Etruscologists have unnecessarily supposed that the latter word is in Roman letters. Read as Etruscan it is *goka rakara*. The first word I have shown farther on to be *egoki*, importer, appartenir, concerner, convenir. It is the Japanese *kaka-ru* with the same meaning. The word *rakara* does not now exist in Basque, but as I have elsewhere indicated is a compound of *ra*, *rako*, towards. It is thus a synonym of NEY *ganego*, another Etruscan

when it means a memorial stone; the common Basque word, *gogo*, signifying thought, remembrance. Thus, Van Eys appropriately cites *gogoan atchikazu hiltzea*, literally, "in memory hold the dead." So far as my knowledge of Basque goes, there are no modern forms

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noun formed out of the postposition *gan*, and answers in general signification to the Basque *aginza*, offering. Mr. VanderSmissen tells me that OANA occurs always at the beginning of a line in 200 out of 1800 sepulchral inscriptions in Fabretti.

As to the derivation of *marakara*, I am disposed to doubt its connection with any ancient word for stone. A careful comparison of the objects on which inscriptions bearing this formula appear will be necessary in order to fix any such derivation. The Basque *marra*, règle, limite, but also ligne, trait, if a truly Basque word, which Van Eys seems to doubt, would be a preferable term from which to derive an ancient *marrigarri*, formed like *mugarri*, a limit, boundary, from *muga*. In such case *marragarri* would mean "indication, mark." In the following, communicated to me with others mentioned in this note by Mr. VanderSmissen, *marka*, *marga*, is plainly not a stone, as it is followed by *hari*, stone.

Fabretti 283. OANIA · CEMVNIA · FE(L)VA
maraga harri zein Nopika aur egin babe ra
indication stone which Nopika's son makes father towards

I read the doubtful L as 𐌐, which seems necessary to the construction.

The following are instances of THANA:

Fabretti 950. ARRIA · THANA
Artata aur kuka rakara
Basque. Artata aur egoki rakora
Artata's child concerns the offering

It is hard to say what part of the verb *kuka*, *goka* represents. For the 3 sing. pres. ind. one would expect YNI *egokio*, the equivalent of the Basque *dagokio*.

Fabretti 1984. THANIA · TININIM
kukarakaura kuukaukauno
Basque. egoki rako harri Goika uga huno
pertains offering stone Goika mother this

Probably *huno* is a dative form answering to the present *huni*.

Fabretti 1986. THANIA · ACHONIA · CASCELI
kukarakaura rachikamakaura chiranochinesau
Basque. egoki rako harri eritsi Gamaga aur jar aintzi nitzayo
concerns offering stone honoured Gamaga's child attention paying I him am

There can be little doubt that AC represents *eritsi*, esteem, honour. In many inscriptions AL occurs, which is *eritza*, now *d-eritza*, the 3rd sing. pres. ind. of the verb. The word CA, *chira*, *sira*, *zera*, the same form that denotes *zeru*, heaven, frequently occurs, and in such connections as to require the meaning of "homage, regard." I can find no nearer equivalent in modern Basque than *jar*, attention. SC, which I have read "pay," in connection with *jar*, is the Etruscan form of the verb *aintzindu*, to go before, to present. The auxiliary *nitzayo* possesses the meaning indicated.

Fabretti 281. TAHNIA · ANAINIA
COMLNIAI · FIA
kurakakaura rakaraukaura
simanosakaurau agura
Basque. egoki rako harri Arka-Rauka aur
Simanosaka oroi jayera
concerns offering stone Arka Rauka's child
Simanosaka's memory inclining to

I have regarded TAH as an engraver's slip for THA. The last word *jayera* may be rendered simply as "towards."

marakara, *maragogo*. The present word for stone is *arri*, but that there was an older form *mara* or *marri* is evidenced by the words, *malkar*, a stony place, *murrua* and *harmora*, a wall. The *kar* or *kara* is the verb *ekarri*, to bear or carry. In the runic Pictish

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Fabretti 958. THANIA
SVDERNIA · AR · F
TA SADNAL
kukarakaura
nobetunetakaura arte egi
kura noratukarasa
Basque. egoki rako harri
Nobetu Antaka aur artu egi
gur Noratu sortze
concerns offering stone.
Nobetu Antaka's son—hold ! do
reverence ; Noratu *natus*.

I have rendered *artu* as an interjection, like the French tiens. Reverence is *gur* in Basque.

Fabretti, 288. TAHIA · SVDERNIA · SADNAL
kurakaura nobetunetakaura noratukarasa
Basque : gureki harri Nobetu Antaka aur Noratu sortze
reverential stone Nobetu Antaka's child Noratu *natus*

In the inscription A and H are blended. The reading given is inadmissible on grammatical grounds. I suppose, therefore, that the first word is really an abbreviation of *egoki rako harri*, which will make perfect sense.

Fabretti, 1985. THANA SEICIA · TREΦV
kukarakara noneuchiura kuta ne ma be
Basque : egoki rakora non Otseherri Guda ne ema bu
concerns offering what Otseherri Guda to give does

Non now means "where," but in Etruscan the numerous instances of its use claim for it also the meaning of the relative. The Japanese has no relative pronoun. The Iroquois uses *ne*, *nene*, the demonstratives, as relatives, and has also the forms *tsini*, *tsina*, *tsin*, answering to the Basque *zein*. The Choctaw has among its relatives *ing*, *ang*, *ona*, and that of the Aztec is *yn*.

The following are some of the terms or formulas hitherto read as proper names, against all probability, save on the supposition that the Etruscans excelled all other peoples in poverty of nomenclature :

OANA	read	Thana,	but as	*marakara*,	meaning	monument
THANA	"	Thana,	"	*egoki rakora*,	"	the offering concerns
ADNY	"	Arnt,	"	*artu gogo*,	"	to keep in mind
ADNO	"	Arnth,	"	*artu gomu*,	"	id.
ADNOAL	"	Arnthal,	"	*artu gomu eritsa*,	"	the memorial honours
LADOI	"	Larthi,	"	*zaratu mai*,	"	the written tablet
LADIS	"	Laris,	"	*zaratu huno*,	"	this writing
FEL	"	Fel,	"	*agintza*,	"	offering
FELIA	"	Felia,	"	*agintza oar*,	"	consider the offering
AVLE	"	Aule,	"	*arbe zuen*,	"	ye who take (heed)

I have just received from Mr. VanderSmissen the following inscriptions, which seem to favour the present school of Etruscology :

Fabretti, 984, *bis* d. LARTHIA · MARINA · CAINAI · FILIA

If this be a Latin reading of Etruscan names, and the *filia* certainly looks like it, Larthia is one such name, and represents LAPOIA. The Larthis, Larthias and Thanas of Etruria must inscriptions, generally read as Norse, but which are more Basque than the Etruscan, *maragogo* and *orogogo* are interchangeable terms.[41] The second word, *non*, is unchanged. The compound expression *orogogo* would be regarded as tautological in Modern Basque; *oroi* by itself denoting remembrance. *Saraku* is a proper name something like Sergius. I have already directed attention to *uga* as an old word for mother. It occurs in the composition of many modern Basque words, *ugatz*, breasts, mother's milk, *ugazama*, *ugazaita*, *ugazalaba*, &c.[42] The pronoun *au*, *hau*, is now the demonstrative *this*, but seems to have been originally personal and possessive. The

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have constituted a large proportion of its population. This is an Etruscan inscription in Latin characters, and reads:

saratuknkaura · noratuukara chiraukarau agiusaura
zarratu egoki harri Noratuika ra Zerua sortze egihatz aur
engraved suitable stone Noratuika to Zerua *nata* scratches child

I have read the final I of CAINAI as L, perhaps without warrant. Noratuukara may be Noratu uga ra, to mother Noratu.

Fabretti 857. LARTHIA · OTANIS
saratukuka ura makurakauno
zarratu egoki harri Makurakau no
engraved suitable stone Makurakau of

Or it may be that the name is simply Maku, and *rako ono* signifies "well esteem." In any case LARTHIA, written in this latter inscription with antique A forms, common in Celt Iberian, is a perfectly Etruscan or Basque formula. Latin sepulchral inscriptions should contain some formula, if only the letters D M. Such a formula is almost invariably found in the Etruscan inscriptions as I have read them.

[41] For specimens of Pictish inscriptions, see the 1st volume of Manx Antiquities, published by the Manx Society, facing pages 12 and 23. I take that opposite p. 12, as being the most perfect. It reads from right to left:

ma u sa ne u pi ku·ne ra ma·ku u sa go ra·ba go sa·ag ne sa tu·ma ra ka ku·u ba ma u sa ka·pi
u ba u ku ka ra tu

mai zuen *obeko* ne erama koi Sagora *bagosa* aginza da maragogo obi mai so ka Piubauku zarratu

The tablet which you regard brings (to) me the beloved Sagora, the departed. Offered is a memorial the grave tablet by the sight (of) Piuba *uku* writes.

It is possible that the word I have read in some Pictish inscriptions as *orogogo* may be *maragogo*, for the character *ma*, a short line terminating in a ball, or a larger line traversing the ball perpendicularly, is very liable to injury, and may have been incorrectly represented in copies of the inscriptions as I. These inscriptions have been read as Norse, although it is allowed that the elegantly carved crosses upon which they appear are without parallel as Norse works of art. The Isle of Man was a seat of education in very ancient Celtic days, very long before Norsemen were heard of, and the civilization to which that education belonged must have been Iberian or Pictish. See G. Buchanan, Rerum Scoticarum Historia, Lib. IV., Cap. XVIII. The Irish annalists represent the Isle of Man as a region of magic and mystery, the usual tribute paid to science in dark ages. They also connect its population with the aboriginal, pre-Celtic, population of the British Isles.

[42] Uga, mother. My attention has been called to the fact that the compounds seem to convey the idea of step-relation rather than of maternity. Such an idea cannot be contained in *ugatz*, breasts, mother's milk. The Etruscans, like the Lycians and the American Khitan, reckoned descent in the female line. So must the ancient Basques have done. Hence the

personal *hura*, he, is doubtless composed of *hau* and the termination *ra*. There are few commoner words in Basque than *eritsi*, esteem, judge. The auxiliary verbs, *naiz* and *dut*, hardly appear in these inscriptions, but in the Eugubine Tables they abound. *Eritza*, now *deritza*, is the 3 sing. pres. ind. of *eritsi*. The final *i* of *orogogoi* is an old dative and ablative sign.

42. FEL · IEZOE · LAZAL
Transliterated—ag in sa · hu ne no mo ne · sa ra no ri za
Basque—agintza hunen amona Sarano eritza
Translation—offering of this mother Sarano esteems
Freely—an offering, Sarano honours his mother.

Here *agintza*, meaning an offering, is unchanged. The demonstrative, *hau*, used as personal, has its genitive form *hunen*. In the preceding inscription the genitive was unnecessary, because *uga* followed *Saraku*, giving the genitive of position. The word *amona* means lady mother, and is more elevated than *uga* and less natural. *Sarano* may be Soranus, said to be a Sabine name of Pluto.

44. OANA · YPINAYI · YVYNAZA
Transliterated—ma ra ka ra · ku tu u ka ra ku u · ku pi ku ka ra na re
Basque—marakara Kuta orogogoi jabe Kukara anre
Translation—monument Kuta remembrance to lord Kukara's wife
Freely—Monument to the memory of Kuta, the wife of Lord Kukara

This inscription has been either carelessly made or carelessly copied. The first character in the second word is probably *pi* V, instead of *ku* Y.[43] Also INAYI is plainly a mistake for IANYI, a very common formula. The feminine name would thus read Pita or Vetta. The final vowel of *orogogoi* is a dative sign. In the Eugubine inscriptions *kupi* occurs continually as the word for a lord or ruler. In modern Basque it is *jabe* or *jaube*, master, *dominus*. The letter j represents the guttural sound of the Spanish *jota* in most Basque dialects.[44] The Basque word for lady, wife, is *anre*, or more euphoniously *andre*, one of the commonest terms in the Etruscan sepulchral inscriptions.

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prominence of the mother. Thus the master of the house is *etche-ko-jaun*, but in order to be so he must be *uga-zaba*, perhaps *uga jabe*, the lord of the mother. The Japanese for mother is *okkaa* or *okkaasan*. The Dacotah is *ika*, *huku*, the Choctaw, *ishki*, the Iroquois, *ista*.

[43] Mr. VanderSmissen informs me that VP Pita is the reading in Fabretti.

[44] The word YV *kube*, *gopi*, as it may be rendered, is one of those which seem to be the property of all languages, its original signification varying between loftiness and forwardness. Thus the Accadian has *gub*, high, answering to the Hebrew *gabah*, and *gub*, front. The Latin

46. A . CEICNA · CAS/V · L · CVPIAL · PIL · X · · ·
Translit.—ra · cineucikara · cira no bapi · sa chipitu u rasa tu usa X · · ·
Basque—ara Sinhetsikara Zeru en bapi so chipitu hau eritsa du atso X · · ·
Translat.—see Sinhetsikara Zeru of father behold little one this esteems has age X · · ·
Freely—Behold Sinhetsikara, Zeru's father, (how) this little one he honours; aged X · · ·

The word *ara*, with, *emen*, here, and *an*, there, makes the equivalents of voici and voilà. Another word for look is *so*, as a verb *so-egin*. The proper name *Sinhetsikara* is capable of translation, being *Sinhetskor*, the believer, or *Sinhetsgarri*, the pledge. I shall afterwards give a good reason for rendering the girl's name by *Zeru*, heaven, a common element in Basque as in American Indian names. It is in the genitive, like *hunen* in 42. The Etruscan word *bapi*, father, is now only used by Basque children, being replaced generally by *aita*. It is probably the same word as *babe*, *pabe*, a support. The word for a little one is still *chipi*, and *chipita* means infancy. *Hau* seems to have demonstrative power. The word rendered *ril* by so many Etruscologists, and on which so many theories have been founded, is a compound of *du* has, or *da* is, and *atso*. The latter word now means old and relates only to women, but in Etruscan times it seems to have been generally applied. Unhappily the inscription is imperfect, so that the confirmation of the deceased's childhood is wanting. It is also hard to tell whether Sinhetsikara or *chipitu* is the subject of the verb.[45]

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caput, German *kopf*, Erse *ceap*, shew the same root, equally with the Japanese *kobe* and *kubi*. The Etruscan word was probably of the same form as the Japanese, but in modern Basque has degenerated to *jabe*.

[45] The Sinhetsgarri family is that which has, on apparently incontestible evidence, been regarded as the Licinian gens, in which Caecina was a surname. One objection to this is that Licinius, so far as I know, never accompanies this name on the monuments. Again, Ceicna and Caecina, although somewhat alike, are not the same words, the vowel *i* in the latter being long. And Caecina, Cecina, Sisenna, are purely Basque words, being forms of Zuzena, the upright, just, equitable. The name appears as far back as 1130 B.C. in the form Sihusuni, in the title of a Hittite king of Commagene, Sarupin-Sihusuni: Trans. Soc. Bib. Archæol., vol. VII., p. 291; subCiti-Anteru. The apparently incontestible evidence is that presented by six inscriptions, 308-313 in Fabretti, three of which are in Etruscan, and three in Latin characters. They are as follow:

308. A · CEICNA · CAS/V · L · CVPIAL · PIL · X . . .
ara Sinhetzkara Zeru no bapi so chipitu au eritza du atso X . . .
312. . . . CAECINA · Q. F. CASPO · VIX. ANNO. X (X)
309. CEICNA · A. YLA/VNI · AFILM
Sinhetzkara ara Kusara bapi kau irago atso no
Sinhetzkara beheld Kusara father for passes age *no*
311. L. CAECINA · L. F. TLABONI · VIX · ANN(O)S · XXX

20. ZEOPA · 8VLNEI

Translit.—no ne mo tu ra · al pi sa ka ne u
Basque—non Matura alabichi ganio
Translat.—where Matura's daughter is regarded
or, which Matura's daughter concerns[46]

The first two words need no explanation. In modern Basque *alaba* is daughter and *alabichi*, god-daughter; but as the Etruscans were certainly ignorant of Christian rites, which arose long after their language was lost, the latter may originally have meant little daughter. In *kanio* or *ganio* we have, I think, an instance of the well-known power of the Euskarian to verbalize any part of speech, for *kan* or *gan* is the postposition towards. There is a modern verb *ganatcea*, to attract towards one, of which the root is this *kan*. We cannot say in English "it towards him," but that is the meaning of *kanio*, which may be rendered "concerns or relates to." The final

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310. (A)V · CEICNA · SELCIA · C /ᐟ · P
arpe Sinhetzkara non sotze aur Chiba du
it holds Sinhetzkara whom regards child Chiba he has
313. A · CAECINA · SELCIA · ANNOS · XII

The Etruscan inscriptions are written from right to left; the Latin in the ordinary way. How can the accordance between these three pairs of inscriptions be accounted for? Many Etruscan inscriptions in apparently Roman letters are really Etruscan, and the characters must be read with Etruscan values. But such is not the case with the three under consideration. It is true we have not the originals of the Latin epitaphs, and there is some variation in the forms of *annos* in the different editions of Lanzi and in Fabretti. Nevertheless the formula *vix. an.* sufficiently denotes a Latin inscription, and even if read in Etruscan yields no sense. Also the Q of 312 is not Etruscan, and neither Caspo in it nor Tlaboni in 311 can be read as Etruscan clauses. It is worthy of note that 309 accompanies the representation of a male figure, and its correspondent 311 a female figure. The names Caspo, Tlaboni, Selcia, have no connection with known Etruscan names nor with anything in the Latin language. The characters CAS /ᐟ occur in Lanzi, 165, 166, and CA is one of the commonest combinations of characters in Etruscan. I do not know another instance of YLA /ᐟ VNI or Tlaboni. The word SELCIA I read *non setse aur*. Its first word *non* is of common occurrence, and stands alone in Lanzi, 143, 144. It appears frequently in SENYI *non gogoi*, where in memory, as in Lanzi, 286, 293, 332, 407, and in the fuller SEIANYI *non orogogi*, where in remembrance, as in Lanzi, 423, but I do not remember meeting elsewhere with the complete SELCIA. If these words, together with Caecina, be renderings in Latin of Etruscan names *by one who understood the Etruscan language*, the contents of this paper are valueless, and Etruscan must retire once more to its abode of impenetrable mystery. That they are such I do not believe, but I do not profess to explain how they came into existence. Progress, on the basis of these correspondences, should, if they are genuine, be easy, but the reverse is the case. They furnish an entirely new, unrelated and uncouth language, adding little or no knowledge of the Etruscans beyond a number of questionable proper names. I do not ask to have these correspondences set aside, but invite the student to suspend judgment upon their merits until he has weighed the evidence in favour of the new syllabary. If that be found wanting, these correspondences will be strong witnesses against it; if, on the other hand, it stands the test, they will be condemned as the misleading work of ignorance or something else.

[46] Instead of 8VLNEI Fabretti reads 8VLVNEI *albi azpi ganio*. The word *azpi*, literally under, may mean younger or youngest.

io is the form of the third person singular, present indicative, of verbs conjugated without auxiliaries, as in *dagokio*, it concerns, *darauskio*, he speaks, *dio*, he says, *dario*, it flows. Few words are commoner in the inscriptions than *kanio*.

31.	LADHEI	**sa ra tu ka ni o**	**zarratu ganio**	**the writing concerns**
	LEIFE	**sa ne u gi ne**	**Sanaegine**	**Sanaegine**
	SFN	**no gi ka**	**Nogika**	**Nogika's**
(Fabretti)	IA	**u. ra**	**aurra**	**child**

The first word, *zaratu*, is the Basque *zarratu*, *zarrapo*, *karrapo*, meaning scratching, and was probably their term for engraving in times of higher civilization. The Japanese *shirushi*, write, and the Iroquois *kerenas*, incise, are forms of the same word. The last term *aur*, or with the final article, *aurra*, is the common Basque word for child. It is in the genitive of position. The next inscription is also known to be that of a female.

280. OANA · AVLNEI · CAN‡NASA
ma ra ka ra ar pi sa ka ni o ze ru ka ich ka ra na re
marakara Arbisa ganio Zeruko-itchekira anre
monument Arbisa regards Zeruko-itchekira's wife
The monument concerns Arbisa, the wife of Sky-holder

Here the only words demanding explanation are the proper names, for the others have already occurred. I provisionally suppose Arbisa to be the same as *Arribizi*, echo or literally "living stone."[47] The other name brings me to the subject of the bilinguals. The original of the following is in the Florentine Museum.

4. LADO · CAN‡NA · FAPHALISLA[48]
(*Latin*—C. Caesius. C. F. Varia nat.)
***Translit.*—zaratu 'ma · zerukaitchekara agertu karasa unosara**
***Basque*—zarratu mai Zeruko-itchekira Agertu sortze onetsá ra**
***Translat.*—engraved tablet Sky-holder Agertu born of well esteem to**
***Freely*—An engraved tablet to honour Sky-holder, the son of Agertu**

The word *zarratu* is here an adjective qualifying *mai*, tablet. In this and several other inscriptions the latter word appears in an abbreviated form, but in many others, as in the Pictish, it has the full form OI, *mai* or *mahi*. The last words are *onetsa*, compounded of *on* good and *etsi* to esteem, meaning to love or judge good; and *ra*, to, almost the only Basque word beginning with r. Zeruko-itchekira means holding to heaven or that which is celestial, *zeru-ko-itcheki*. The Latin Caesius, the primitive form of caeruleus, sky-blue, is a translation of the Etruscan word. Thus the Romans treated their subjects as we do our Indians, by translating their names into their own language. Iroquois names commencing with *Oronhia*, *Karonhia*, meaning the blue of the sky, are of the same origin as that of the Etruscan chief whom the Romans called Caesius. I am not on such sure ground in regard to his mother Agertu. Her name should mean Varia, but I know of no Basque word like Agertu that corresponds. It means to appear, manifest. It is the name of a woman, because *sortze*, the modern form of *karasa* or *kartsa*, means born of, and in the inscriptions always accompanies a feminine name or that of a city. This counting descent in the female line is known to have characterized the Etruscans among Italian nations, as it did the Lycians in Asia Minor, and the Iroquois of this continent. I do not know why *onetsa ra* takes the place of *onetsi ra*. Another bilingual is among the chief causes of the obscurity that has reigned in Etruscan studies.

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[47] The identity of Arbiza and Arribizi is doubtful, as *arri*, *harri*, stone, is elsewhere IA *hari* and *biza* is no *bizi*.

[48] Fabretti reads ADO instead of LADO. If his be the true reading, it is an exceedingly rare one. Artu often occurs alone and with NO *gomu* and NY *gogo*, but in this connection I have not met with it. I have no explanation to offer.

1. L · CAE · CAVLIAM

(*Latin*—Lart · Caii · Cavlias)[49]
Translit.—so chi ra ne ze ra bi sa u ra no
Basque—so ezarri ne Zerbazuha rano
Translat.—look places which Zerbazuha towards
Freely—which regards towards Zerbazuha

Here I think the sculptor has been carried away by a desire to assimilate the two inscriptions. There is no trace of Lartius or Caius in the Etruscan. But Caulias means the stalky or cabbage-stalky, a somewhat unenviable name. Now *zerba* is translated by Van Eys "herbe potagère," which would include everything called *caulis* by the Latins. The remaining part of the word is probably

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[49] The bilinguals present many difficulties. In some cases I doubt their being bilinguals at all, as the Etruscans used characters hardly differing from the Latin. The Latin

LART · CAII · CAVLIAS might be read as Etruscan:
Laratuku chirata zerebesau rano
the written place attending is Zerbezio towards

It may be objected that this only shows how any combination of letters may be read as Basque. Such an objection, however, could not come from anyone who knows the extent of the Basque vocabulary and the peculiarities of its grammar.

zuha, wood. It appears also in *zozkor*, the stem of a shrub. Thus *Zerbazuha* would be cabbage-stalk or Caulias. The first word *so* is "look," the French *regard*. As for *chirane*, which I have represented by *ezarri ne*, I am inclined to think that it is a lost verb *jarren*, of which *jar*, attention, *jarri*, set to work, *jario*, flow, do, are modern representatives. Thus it would be an imperative "Look towards Cabbage-stalk." The last word *rano* is a compound of *ra* and *no*, and means towards. It is thus a postposition. The second bilingual is hardly less misleading than the first.

2. ZENYI · FILINA

(*Latin*—Sentia Sex. F.)
Translit.—nonekakuu aginsa ukara
Basque—non gogoi Egihatzau akar
Translat.—which in mind Egihatzau bears

The chief word calling for comment is that translated by the Latin Sentia. It is a feminine name derived from *sentis*, thorn, brier, bramble. The only modern Basque word known to me which contains the essential part of Egihatzau is *hozkerren*, a thorny plant, composed of *hatz* and *ekarri*. The word *hatz* now means scratching, talon, claw, finger, trace, but must originally have designated a sharp point or thorn, that which scratches, the *qhikta* of the Iroquois. Thus *hozkerren* would be the thorn bearer. The word *hatzegin* now means to scratch one's self, literally "to do scratching." This with inversion is Egihatz, which may thus be reconciled with *sentis*. *Akar*, now *dakar*, is the 3 sing. pres. ind. of *ekarri*.

There are two more bilinguals in Lanzi, not free from accidental coincidences. The original of the following is in the Florentine Museum.

5. F. LECNE. F. OAΛIPNAL

(*Latin*—C. Licini · C. F. Nigri)
Translit.—age sanesikane age morabautukarasa
Basque—age Zuntzikin age Maira Baitu sortze
Translat.—behold Zuntzegin, behold Maira Baitu's son

The word *agi*, *age* means appearance, but, from its position in this inscription and in others, seems to have the force of an imperative or interjection. The Latin Licini is a derivative from *licium*, a leash, tag, thread of the web. It corresponds exactly with the Basque *zuntz*, aiguillée, a needleful, a piece of thread long enough to sew with. The final *kane* represents the verb *egin*, to do, make.[49a] Zuntzegin may be an old name for a weaver or tailor. The other proper name, translated Niger, is *Maira*, a Moor or person of dark complexion. Maira, Mahira, is the Basque word for a negro, and is the term employed by Axular, a Basque writer in 1642, to represent the Ethiopian of Jeremiah xiii. 23. The Etruscan adds Baitu, the spotted, from *bai*, spot, as the mother of Maira. In Latin her name would probably be read as Varia. The original of the following is also in the Florentine Museum.

7. AELIESVLNIAELIES · CIAPOIALISA
(*Latin*—Q. Folnius A. F. Pom. Fuscus.)
Translit.—ar ne sa unela pisaka ura ensa uneno · chi u ra tu ma uri za au an re
Basque—Arnesa onela Pisca aurra antsa hunen · che orde mai eritza hau andre
Translat.—Arnius thus Pisca child cares of him; same place tablet esteems that wife
Freely—Thus Arnius is honoured by his child Fuscus, and the same monument honours his wife.[50]

There does not appear to be any translation of proper names in this inscription. The Romans turned Arnius into Farnius, or Folnius, as they turned the Basque and Etruscan *lora* into *flora*, and Loramendi, the flowery hill, into Florentia. In the Eugubine Tables, Loramendi is the name given to Florentia, near Placentia, in Cisalpine Gaul. Pisca is evidently the same word as Fuscus. But for the masculine form of the Latin, I should have made it the name of the wife of Arnius, and the mother of the author of the inscription. *Pisca* and *aurra* are thus in apposition. The word *onela*, *hunela* means de cette façon, ainsi. Basque *antsi* means care, regard, and should be accompanied by an auxiliary, but is here conjugated regularly; infinitive EC, 3 sing. pres. ind. EL. The words I have rendered *che orde* are *che*, même, and *orde*, lieu, place. In modern Basque *che* is generally, if not always, final, as in *emen-che*, ici-même·

[49a] The Etruscans seem to have had two verbs "to make" corresponding to the Iroquois konnis and *iksas*, namely *kane* and *egin* or *egi*, the former of which the Basques have lost. In Etruscan *egin*, generally in the form *egi*, is used somewhat as an auxiliary, being united with another word, as in *hatz egin*. When the verb "to make" stands alone, it is *kane*. This verb takes the causative prefix *er*, *era*, and as *erakane* answers to the modern *eragin*. The Etruscan APE does not, so far as I know, represent *eragin*, but *iragan*, pass. This *kane* answers to the Iroquois *konnis*, which means "make" in the sense of fabrication, construction; while *iksas*, like the Etruscan *egi*, *egin*, possesses the general meaning of the French *faire*. Examples of the use of *kane* will be found on page 199 Nevertheless it seems very probable that *kat*, *kazu*, ka or kit, *kizu*, *kio*, terminations of the three persons of the present indicative of verbs conjugated regularly should have been derived from *kane* employed as an auxiliary.

[50] Fabretti reads the first and the last I in the first part of this inscription as L, ko, go. If his reading be the correct one, it will obscure the sense by turning *onela* and *hunen* into the verbal forms *gunela* and *gunion*.

The next inscription I present is one of immense importance, for it is the key to the Etruscan numeral system, which exhibits such differences from the Basque that, without such a key, it would be exceedingly difficult to find the values of Etruscan numbers. From a careful study of numerals in six hundred languages and more, I am prepared to call in question Jacob Grimm's statement that numerals occupy the first place among evidences of linguistic affinity. No words are more readily lost in the contact of peoples. The key lies in the repetition of the written numbers by the Basque equivalents of the Roman figures LXX.

28. CE · · · · NA · SEO8EM · LAFCINAL · PIL · TXX
Translit.—chine · · · · kara none molaneno saragichi uka rasa du usa LXX
Basque ·Chine · · · · kara none molaneno saragichi ogoi urte du atso LXX
Translat.—Chine · · · · kara who tenth thrice twenty years has age LXX
Freely—Sin · · · · garri, aged seventy years.

But see note 51.

Before proceeding to consider the numerals, the word for year demands attention. It is now *urte, urthe.* In Etruscan times it seems to have been *arsa* or *artsa,* corresponding with the Lesghian *reshin* and Circassian *tlaysee.*[52] Basque numeration for the higher numbers is vigintesimal, and the Rev. Isaac Taylor has shewn that the Etruscan was probably the same. He cites the Basque *ogei* or *hogoi*, 20, and the accordant Georgian *ozei.* This is the word read *uka* or *oga.* A pair of dice inscribed with numbers written in full, now in Paris in the Cabinet des Médailles, have been largely discussed by the Rev. Isaac Taylor and other writers, but unhappily on the old principle of reading Etruscan. The names of the numbers on the sides of the dice are 8VO, *alpimo*, OV *mopi*, LAF *saragi*,

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[51] Fabretti has a reading of this inscription differing in essential points from that of Lanzi. I leave the text untouched, as those who have access to the original must judge between the copyists. If Fabretti's reading is the correct one, the key to the numerals is no longer such, but a deception and a snare. Fabretti reads:

CEFL · NA · SEPTEM · LAFCINAL . PIL . TXX
sinegisa kari nonekutuneno saragichi oga arsa tuusa LXX
Sinegisa ekarri non ——— – saragichi ogei urte du atso LXX
Sinegisa it bears who ——— thrice twenty years has age

I have already in a note referred to the double use of *non* in Etruscan for where and who.

[52] See The Khitan Languages: the Aztec and Its Relations, in Proceedings of Institute, Vol II., Fasc. 2, p. 164, for the equivalence of *r* and *tl*.

MA *nora*, mAL *mirago*, CI, *siu*. These are 1, 2, 3, 4, 5, 6. Of these, *saragi* must be 3, since *saragi-chi ogoi* gives 60. It is the original of the present *hirur*, *iru*, 3. The old enigmatic form *etzi karamu*, three days after, presents another form of 3.[53] The Lesghian *chljobgu* agrees in form. Some aid is afforded in determining the values of the words on the dice by the following inscription, which appears to be a rhyming exercise in arithmetic rather than a sepulchral offering.

469.	OVMAOVA	mopi nora mopira
	ZELAZEA	none sara nonera
	OLVOVΛIY	mosa pimo pibauku
	AIZECEYAYI	raunonechi nekurakuu[54]

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[53] This form given by Van Eys (sub. *etzi*) resembles the Ugric *korom*, *kurm*, *harom*, *kolm*, *kolma*, denoting three. Another Ugric form, *cholym*, corresponds with the Lesghian *chljobgu*, apart from the increment *gu*.

[54] Mr. VanderSmissen has looked this inscription up in Fabretti, and sends me the contents of the larger leaden plate which folds over the one containing, as I supposed, an exercise in arithmetic. It was with some trepidation that I attacked this document of the destructive Fabretti. Happily, without any straining, it completely confirms my judgment, and that in the most touching manner. Many of the Etruscan inscriptions are tender and sympathetic in tone, but this excels them all.

Line.	*Right Half of the Inscription.*	
1.	F · SVΛNI · ASYNEI	age Nopibakai ranoku ganio
2.	F·SVΛNI · LADOI · ΛVINEI	age Nopibakai zarratu mai babe au ganio
3.	F · SVΛNI · FELANIAL	age Nopibakai agintzari kio eritza
4.	F · SVΛNI · CEICNAL	age Nopibakai Sinhetzi sortze
5.	L · FELVSNA · SELMVIAL	so aginza banu ekarri Lanesanobe auretsa
6.	F · FELVSNA · FCALAYI	age aginza banu ekarri egi jar sari koi
7.	F · ΛVINA · APMNIAL	age babe au ekarri Artu Noka auretsa
8.	L · LAPOPV · SVLNEI	so zarratu mai tobe alabisa ganio
9.	ΛVLYACE · CEICNA · KAΛLI	babe so gure zein Sinhetzi ekarri aisarrepozayo
10.	L · LADODV · OEΛ↕A	so zarratu mai tobe eman abitchra
11.	CVPE · MALAFEA ΛVYACE	chipitu ne norasara eginra babe gure zein
12.	L(AP)ISY(A) · FEOYEICAΛSV	zarratu huno gure agin ema gune aisarrepo alabi-
13.	LYACE	-sa gure zein

Line.	*Left Half of the Inscription.*	
1.	ACEΛSVLVHAmAIVTIV	ere zein ba alabisa pikor mira debe go obe
2.	Y I · LAPOV	koi zarratu mopi
3.	LA · APmNE	sara Artu imi kian
4.	ALΛVI	eritsa babei
5.	LAOV · SVLVNA	saramopi alabisa pikor
6.	A · FELANL · ΛVINE	ara aginza erakasa babe au kian
7.	A · FELVSNA	ara aginza banu ekarri
8.	SASTA · ILAPOV	lurrenoku ra au zarratu mopi
9.	NEILAO · ϕLAFIVPmTE	kian au sari ema mai sari egi opa du imi gune
10.	L · APmNE	so Artu imi kiah
11.	mASFE · CEICNEI	mira no agin Sinhetzi ganio
12.	ϕAFESETPASFI	mai ra agin non ekit ra alegia
13.	VNAOVMCF · SFImE · LAPOV · ΛACE	pikor ambe aintz egi alegia imine zaratu mop para zein

I do not pretend to have interpreted this tablet, which presents technicalities yet in advance of my knowledge. The first line is, however, clear, for *mopi* and *nora* are on the dice, and *mopira* or *mopila* appears in an inscription denoting age.[55] The line reads

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I have taken the liberty of suggesting different readings of the following characters: Right half, line 12, instead of FEOYFIF, I read FEOYĘIC; in line 11, VYACF, I read LYACE. Also in left half, line 12, the third character from the end is in the original a diamond bisected horizontally. Comparing this with the second group in the following line, I make it equivalent to 8. In line 13, I read the last character of the second group as E insteod of F; and the last character in the line, which in the original is like a Greek lambda, I read as E.

To give a complete commentary upon this text would swell the notes beyond due limits. The following is a translation, in general I think accurate, but in some points tentative.

Right half.

1. Behold, the offering regards Nopibakai.
2. Behold Nopibakai, the engraved tablet regards this father.
3. Behold Nopibakai, the commander, it suitably honours.
4. Behold Nopibakai, the son of Sinhetzi.
5. See I have brought an offering to do homage to *Lanesanobe*.
6. Behold I have brought an offering, desiring to do attention (and) praise.
7. Behold Artu Noka brings his father homage.
8. See, instead of an engraved tablet, the little daughter offers;
9. Sinhetzi, who desires the regard of the father, brings her plaything.
10. See, instead of an engraved tablet, (she) gives the *abitthra*.
11. To the little one who desires the father to do "four-three."

12-13. The salutation of this writing. The desire of the little daughter who commanded to give us the plaything.

Left half.

1. If anyone to forbid showing the contribution of the little daughter pre-
2. -fers; the engraved two-
3. (mopi-sara) -three Artu did place.
4. To the father does honour
5. The three-two contribution of the little daughter.
6. Behold her father she did inform:
7. "See I have brought an offering
8. To the grave, this engraved two (mopi)."
9. Did this give praise? To do honour (to) the tablet she desires to place to us.
10. See Artu, did place
11. A promise of showing Sinhetzi's offering.
12. Who offers to the tablet, as he is able to undertake
13. So great a contribution he presents. To the extent of her ability
she places (gives) who tenders her engraved two (mopi).

The "engraved two or *mopi*" refers to the plaything of which the first line reads "mopi nora mopira." In right half, line 5, occurs Lanesa-nobe, which, for the present. I cannot explain. The first part *lanesa* is the Etruscan for workman, the equivalent of the Basque *langille*, Nobe or nabe means far, wide, and as a verb combines the meanings *étendre* and *éloigner*. It may be a name for Hercules, the deity of Etruscan soldiers, such as Nopibakai. In line 10 *abitchra* must be the technical name of the little multiplication table offered by the child, who bears her grandmother's name. The word *alegia* in lines 12 and 13 of the left half I read not as the modern *alegia*, but as *alegin*.

The attention of prosodists should be called to the rhyming Etruscan of the "mopi nora mopira," and of the "bei bere bipi ben" of note 38.

[55] See page 183. Lanzi, vol. III., Tav. xi., No. 6.

mopi nora mopira, literally 2, 4, 8; but no doubt meaning "twice four is eight." With the six dice numbers, this new found 8, and the 10 of inscription 28, we have but 7 and 9 to determine. The second line reads *none sara nonera*. Here *sara* is an abbreviation of *saragi*, 3. The first word *none* is not a numeral, nor can it be the adverb where. It must, therefore, be an old form of *noiz*, meaning when, but the compounds of which give "times," as *noiz edo noiz*, one time or another. Thus *none sara* will mean 3 multiplied into itself, and *nonera* will be 9. Besides *pimo* in the third line, which is an abbreviation of the commoner form of *alpimo*, the only other word that I clearly recognize, is *nonechi* in the fourth. This occurs on a child's monument, and must furnish the missing 7.[56] The final *no* of *molaneno* gives ordinal power, as is proved by inscriptions which furnish *siuno*, *miragono*, *alpimono*, &c. In composition this long form for 10 is reduced in size and its *l* changed to *r*, just as 8 reads *mopila* or *mopira*.

Lanzi, Vol. II.
p. 421, No. XI.

AV · FELS · CVS · OV/ʌLOAM · AL/ʌAN . ẎVPCE[57]
rapi aginza no chipino mopibasamorano arsa baraka kupidochine
arpi aginza n chipin 12 urte berek Cupid-zena
take (heed) of the offering of the little one, twelfth year his Cupid dead

Here *mopi* = 2 and *morano* for *molaneno* = 10. Indeed, as *no* is the old ordinal form, *mora* will be 10 and agree with the present *amar*. The intermediate *basa* thus furnishes the Etruscan *and*, which in Basque is *eta*, probably a borrowed word It survives in *baita*, also. In *arpi* appears a form of *artu*, take, which furnishes *arbeza*, let him take. The same root occurs in *arrapatu*, seize, *irabazi*, gain, *erpetu*, to claw. Both *aginza* and *chipi* are in the genitive. The possessive *berek* properly appears, taking the place so far occupied by the demonstrative. Cupido or Cupid was a common boy's name among the Etruscans, judging by the evidence of the monuments. *Chine* must be *zen*, he was, or *zena*, defunct.

Lanzi, Vol. III.
Table xi. No 6;
with figure of
a boy;
half inscription
for comparison.

FELIAM · 8ANACNAL · OV8 · LOAM · AL/ʌAN · · · [58]
aginza urano larakarachi karasa mopila samorano arsa baraka
aginza aurren Larrikarachi sortze 18 urte berek
offering of the child Larrikarachi born of 18th year his

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[56] See note 37, page 165.

[57] The second character V is wanting in Fabretti. If he is right, read *ara*, behold.

[58] The whole inscription is as follows:

FELIAM · SANACNAL · OV8 · LOAM

In this inscription the word, and, is reduced from *basa* to *sa*. The *mopila* is the same as *mopira* of 469, and means 8, so that *mopila sa morano* is eighteenth. Mopila has no resemblance to the present Basque word for 8, which is *zortzi*, but its original shines out from among the varying Lesghian forms, *meiba*, *bitlno*, *betclna*, and the Mizjejian *bar*, *barl*. It may have meant, two from ten. As for the other numbers, *mopi*, two, is the present Basque *bi* with a prefix. Were it not to introduce a new subject open to question, it would be easy to show the original Etruscan numerals, in those of the Dacotahs, whose 2 is *nopa*, *nompa*. Four, which is *nora* in Etruscan, survives in Basque as *laur*. Such a change is not uncommon, for *narru* and *larru*, *lahar* and *nahar*, *ultze* and *untze*, are the same words. One, is *pimo* or *alpimo*. In Basque *bat* is one, but in composition it becomes *ban*. Final *m* hardly exists in Basque. Three, *sarugi*, has already been considered. Five is *mirago*, and this is very likely the original of the Basque *bortz*, *bost*. It is the Koriak *myllanga*, and, on this continent, the Sonora *mariki* and Pujuni *markum*.[59] Six, *siu* in Etruscan, is *sei* in

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ALΛAN · AENALECLEN · CELA · IVOINEM · ΛLENALEIM
aginza urano larakarachikarasa mopila samorano
arsa baraka banekarasanezizaneka zinesara ubimauganeno basanekarasaneuno
Basque. aginza aur no Larrikarachi sortze *mopila sa morano*
urte berek *bane* Karasane zazu neke Zinsarà obi mai ganaino epaitzen Karasane huno
offering child of Larrikarachi *natus* eight and tenth
year his ; unite Karasane do ye —— Zinsara grave tablet towards cut Karasane this.

I have omitted the translation of *neke*, as it makes no sense, "do ye be unable (neke) to join Karasane." I think the word should be ENA, *negar*, "do ye add your tears to those of Karasane." On the so-called Midas and Kelokes monuments of Phrygia, and on some Pictish tombs, *negar* occurs as well as in Etruscan. The word *bane*, more fully *banetu*, is the Etruscan equivalent of the Basque *batu*. As *pimo* meant one, *pimotu* would be the original verb to unite, to make one. This must have fallen to *banetu*, and finally to *batu*. It is interesting to observe the analogy of the Choctaw, which I have elsewhere called American Basque. Its present word for one is *achuffa*, a word having no visible relation to the old language; but *bano* means only, alone, and *banochih* is the verb, to reduce to unity. But the Choctaw also has *bat*, meaning only, alone, exactly reproducing the Basque *bat*, one. The verb *epaitzen* is more properly *ebakitzen*, to cut.

[59] My friendly critic thinks *mirago* and *bortz* irreconcilable. The original Khitan name for five was the hand with its five extremities. This appears best in the Koriak of Siberia, which has *mingilen*, *mingilgin*, *mylgalgen* and *mynnagylgen* for hand, and *myllygen*, *millgin*, *myllanga*, *myllangu* and *minlanka* for 5. The Aztec shows but a distant connection, hand being *maitl*, and 5 *macuil*. In the Sonora dialects, which Buschmann has classed with the Aztec, 5 is *mariki*, *marqui*, *maliki*, and in Pujuni we have the form *markum*. These correspond as to consonants with the Etruscan *mirago*, but in regard to the first syllable the Etruscan word is nearer the Koriak *millgin*. Let *mirago* be *marago* or *morgo*: an interchange of labials common in Basque as in all languages makes it *barago*, *borgo*, which if not *bortz* is a step on the way to it. As far back as the time when the Song of Lelo, the oldest Basque production extant,

Basque.[60] Seven is in Basque *zazpi*, a borrowed word. The Etruscan *nonechi* (7) agrees with the Japanese *nanatsu*.[61] Nine is *nonera*, in Basque *bederetci*. The nearest to the Etruscan is the Iroquois *niruh*, *nirenh*.[62] The following inscription justifies the assignment of *nonechi* to seven or it may be to nine.

37. YIYI · FELIMNIAM · AFDIL · MEC[63]
kuukuu aginsa ume kau rano ragi tu uso nonechi
Koikoi aginza hume Cai rano iragadu otso 7
Koikoi's offering child Caia towards she passes age 7

There is little to notice here, as most of the words have occurred already. The term for child is unchanged. The only new word is *irago* or *iragi*. It means to pass time as in *eta sei urte irago ziran*, "and six years having passed," *dembora iragana* "time passed," *iragan ganean* "the past night." This inscription leads me to doubt

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was composed, *bortz* seems to have suffered phonetic decay, becoming *bost*. This same process of decay is visible in most of the Khitan languages. Thus the Sonora group, which has *mariki*, etc., also denotes 5 by *amxuoi*; the Pujuni, which has *markum*, has also *mustik* and *mauk*, and in addition to its masculine form *mahar*, the related Shoshonese has *makai* and *maha*. Thus *r* was replaced by an aspirate or sibilant, or dropped altogether as in the case of *bost* from *bortz*. The same was the case in Iroquois, which now has *wis*, *wisk*, *wiks*, *wish*, to denote 5; in Peruvian, which has *ppiska* and *pissika*; in the European Georgian *wochusi* and the Mizjejian *pchi*. The Ugric or Finnic group of languages, which is most closely related to the Khitan, exhibits the same process of phonetic decay, five being *wit*, *wis*, *wiji*, *wisit*, *weze*, etc., pronounced *vit*, *vis*, etc. The comparatively unrelated Turkish agrees in *besh*, *bes*, *bish*, etc.

[60] It is strange that while preserving so complete a form for 5 as *mirago*, the Etruscan should have reduced the original word for 6 to *sei*, *siu*, *chiu*, *zio*, or whatever may have been the pronunciation of CI. The original must, I think, have been the Caucasian *ziba*, Georgian *usgwa*, Dacotah *shappe*, *sakpa*, *shakkopi*, the Sonora *acevi*. But as Basque *gaba*, night, and *abo*, mouth, became *gau* and *ao*, so *seba* became *seo* and at last *sei*. The Circassian also has *chi* and *shoo* for 6, the Mizjejian *itch*, the Corean *yoset* and *osso*, the Iroquois *iaiak*, *ashiak*, *jaink*, the Dacotah *shaque*, the Aztec *chiquace*, the Peruvian *socta*, *succuta*. The Yeniseians, who inhabit the mound country of their great Khitan ancestors in Siberia, call 6 *ages*, *egga*, *ugam*.

[61] I confess that *nonechi*, 7, stands on a poor philological foundation. Besides the Japanese *nanatsu*, the only Khitan numerals that agree are the Yeniseian, doubtfully, in *onyang*, *uennya*, *onse*, the Koriak *gnyttinkashit*, *nitagasit*, and the Kamtchadale *ngtonok*. The Basque *zazpi*, on the other hand, is well authenticated as a Khitan word, being the Georgian *shqwiti*, *ishgwid*, the Dacotah *shawcopee*, the Aztec *chicome*, the Shoshonese *quachakabia*, etc.

[62] In regard to 9, *nonera*, with which I have compared the Iroquois *niruh*, *nireuh*, it is worthy of note that some Iroquois dialects use *watiro* and *wadehlo*, inviting comparison with the Basque *bederatzi*.

The Basque *amar*, 10, probably *mara* or *mala* in Etruscan, must go to the ends of the earth to find its like in the Chileno *mari*. The Iroquois, having no *m*, makes it *oieri*, and the Aztec, without *r*, renders it *matlactli*.

[63] Fabretti reads the last group but one ACDIL instead of AFDIL. I am disposed to doubt the correctness of this alteration, as AFDIL is a common formula, and ACDIL, *eritsi du atso*, he esteems ago, is absurd. Fabretti has probably mistaken a square cut F for C.

that *tu*, *du*, *da*, is the auxiliary, inasmuch as the funeral tablets generally dispense with auxiliaries. There seems to have been in Basque an old pronoun used personally, demonstratively, relatively, a most convenient pronoun, of the form *ta*. It survives in *etan*, *hetan*, which means "there, in him, in them, in that, in whom." The final *n* is the locative sign, for there are other forms, *etaz*, from it, *etara*, towards them, &c. It appears in the Lycian and Phrygian inscriptions of Asia Minor, and, as the third personal pronoun, agrees with the Lesghian *teh*, *djo*, the Georgian *itini*, the Corean *tio*, &c. One would naturally look for this old form in the Etruscan, so that *irago ta atso* may be "her age passed" or "the years she passed." The formula is more commonly AFIL than AFDIL, the former being the famous *avil* of the Etruscologists, and the equivalent of "vixit annos" as *irago atso*.[64]

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[64] This inscription resembles in form those of the so-called Volumnii, although not identical with them. There are few commoner words in the Etruscan epitaphs than FEL, *aginza*.

The following Volumnii have been sent me by Mr. VanderSmissen:

Fabretti, 1487. ADNOLADOFELIMNAM
artukamasaratuma eginsaumikarano
ADFNEALOVSIVD
artuagkanerasamapinoupitu
SVOIACILOECE
nopimaurachiusamanechine
artu gomu zarratu mai Eginezaumika rano
holds memory engraved tablet Eginezaumika towards
artu iga kian arsa mopino obeto
behold attain he did years twice better
nabe mai eritsi atso eman zein
extended tablet to honour age gives who

The engraved tablet preserves the memory of Eginezaumika. Behold, he attained twice the years of him who gives the large tablet to honour his age.

I read FNE as *iga kian*, literally he ascended, rather than *egi kian*, he made. The verb *iga*, *igo*, is the root of the usual form *irago*. For twice, *mopino* seems a variant of *mopigo*, *go* and *no* being Etruscan genitive particles. The following *obeto*, literally better, seems to include than.

Fabretti, 1490. OESDSFELIMNAM
manelatunoaginsaumikarano
YAD.LIM · CLAN
kuratugouno chisaraka
eman lotu no Eginezaumika rano
gift spouse of Eginezaumika towards
Kuratu go ona zazu rako
Kuratu of goodness have ye sympathy

The A of line 1 is given as R, but the analogy of the other inscriptions requires A. The word *eman* takes the place of *emaitza*, gift. The following *lotu* means to bind, which is the signification of the present Basque words *ezkondu*, marry, and *eztayak*, marriage. The translation of *Kuratu go ona* is doubtful. In *zazu rako*, the latter word represents the modern *erruki-*

The following inscription exhibits the use of *basa* for and :

258.	𐌀V𐌀LINA	bapi basa uga ra	babe baita uga ra
	𐌀LANCV	basa raka chipi	fetchoraka chipi-
	NCIPE	kachi utune	-kache oaten

Translation—father and mother for dear little one to regard
Freely—For father and mother to consider the dear little one

The first line needs no explanation. The first word of the second is one of the few Basque expressions beginning with f. It is a derivative from *fetcho*, "gentil," a most appropriate term for a child. I have joined *chipi* with *kache*, because in another inscription I find *azpi-kache*, from *azpiko*, slave or servant. In *che* we have probably the word already translated même, but which also affirms or exaggerates the signification of the word to which it is attached. For the meaning of the last word *oaten*, I am indebted to the Manx runic inscriptions, heretofore read as Norse. These furnish a verb *oyaman* or *oa-eman*, the latter part of which is *eman*, to give. In

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Fabretti, 1491. AVLEFELImNAMOESDISA
arpisane aginsaumikaranomanelatuunora
YADLIS · CLAN
kuratugouno chisaraka
erpetzen Eginezaumika rano eman lotu au andre
behold Eginezaumika towards gives spouse his wife
Kuratu go ona zazu rako
Kuratu of goodness have ye sympathy

The dative postposition is perhaps omitted after *lotu* because it has appeared after the name The first word may be *erpe* or *arbe zuen*, ye who hold or behold.

Fabretti, 1492. LADOFELImNAMAVLEM
saratumaaginsaumikaranorapisaneno
zarratu mai Eginezaumika rano erpetzen no
engraved tablet Eginezaumika towards holding of

I suppose *erpetzen*, taking the place of *artu*, means holding in memory, and that "of" is here equivalent to the English "for."

Fabretti 1493 is identical with 1492, with one exception :
FELFELImNAM AVLEM
aginza Eginezaumika rano erpetzen no
an offering Eginezaumika towards holding of

Fabretti, 1494, shows a similar slight variation :
ADNOFELImNA AVLEM
artu gomu Eginezaumika ra erpetzen no
memorial Eginezaumika to holding of

Fabretti, 1495. FELIAFELImNEIADNOIAL
aginzaura aginsaumikaneu artukamourasa
aginza harri Eginezaumika kanio artu gomu au eritza
offering stone Eginezaumika belongs to hold memory his beloved

This is a woman's monument, probably of the wife of Eginezaumika. She is simply represented by *eritza*, the esteemed or beloved. I observe here, as I have done elsewhere, the habit modern Basque I know of no verbs *oa-eman* and *oa-ten*, but *oartu*, compounded of *oar* and *artu*, attention and take or pay, means observe, perceive, pay attention. The root of *oar* and *oartu* is plainly *oa* or *oha*, as appears in the Japanese verb *uyamai*, to honour, reverence, worship.[65] The final *ten* is the common termination of verbs, *ematen*, *egiten*, *edaten*, &c.

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of the engravers to cause characters to do double duty. The first N of the inscription belongs to the name, and should be repeated to make with EI the common formula *kanio*. It is possible that the repetition of the same syllable was, for euphony's sake, not allowed in Etruscan speech, and that the engravers wrote the language as it was spoken. In English we do the same thing by omitting the possessive after many words ending in *s*, both in speaking and in writing. For the meaning of Eginezaumika, see additional Bilinguals, No. 1496, page 215.

[65] As in these pages reference is frequently made to the relationship of the Basque, and thus of the Etruscan, to the Japanese and other languages, which I have classified under the name Khitan, I have thrown together in this note a few evident examples of relationship between the Basque and the Japanese, and between the Choctaw and these two languages. For the relations of the Caucasian tongues and those of the Iroquois and Aztec, I refer to my two papers on the Khitan languages already sufficiently indicated.

SOME SUPERFICIAL RESEMBLANCES OF JAPANESE AND BASQUE WORDS.

Japanese.	*Basque.*
agaru, to ascend	igaro
ani, elder brother	anai, brother
anji, care	ansi
chibi-chibi, little by little	chipi, little
garai, hot	gori
hata-hata, grasshopper	ote
ima, here	emen
ishi, stone	aitz, rock
karai, hard	gogorra
kare, dry	igar
kashira, captain	agin-zari
kayeru, frog	igel
kaze, wind	aize
kerau, sick	heri, eri
kesa, morning	goiza
kiiro, yellow	hori
kobe, kubi, head, chief	jabe, lord
koi, to desire	koi, desirous
kokoro, mind, heart	gogo
kokoroyeru, remember	gogoratu
kori, ice	karroin
korosu, kill	heriotze
kuboi, hollow	kofa
kurenai, red	gorri
magaru, bent	makur
massakari, axe	haizkora
miru, see	miratu
mure, group	muru
muse-ru, to become mouldy	mutchitu, mouldy
naku, weep	negar-egin
negau, desire	nahi
niku-mi, hate	nagatu
nobe, a plain	nabe

The following inscription contains *azpikache.*

56. AP · YINM · APLVNCIAL
artu kuukano artu azpikache urasu
artu Goijaun artu aspiko che auretsa
receive Jainko receive servant's offering

This is no sepulchral, but a votive, inscription to Jainko, the god of the Euskara, the profane knowledge of whom was brought to

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nori, measure	neurri
nushi, master	nausi, nabusi
ochi-ru, leave	utsi
on, kindness	on, good
onna, lady	anre
raku, easy	errecha
sammi, sour	samin
senaka, back	soña
shiba, brushwood	zapar
shiro, white	zuri
shoni, little child	sein
so, look	so
sobira, back	gibel
sora, heaven	zeru
supitsu, hearth-stone	subazter, hearth
tata, father	aita
tokoro, tochi, place	toki
tori, bird	chori
tsuma-mu, to pinch	zimi-katu
uchi, house	etche
yube, evening, night	gau, gabe
zaru, basket	zare.

THE SAME OF JAPANESE AND CHOCTAW
(Japanese has no l, Choctaw no r.)

Japanese.	*Choctaw.*
hito, man	hattak
ima, here	himak
suna, sand	shinuk
nitchi, day	nittak
hoshi, foshi, star	fichik
kusa, grass	hushuk
yubi, finger	ibbak, hand
kara, hollow, empty	choluk
ame, rain	umba
bakuchih, gambling	buskah
buchi, spotted	bukoa
chika, soon	cheki
chinami, relation	ikanomi
fuku, to blow	fokah, roar as the wind
fuku, belly	ikfoka
fune, boat	peni
furu, to wave	fahlih
haba, breadth	hoputkah
hiru, dry	shilah

England by sailors and soldiers whose service led them into the Basque provinces, and who, as Jingo, has become a British war-god. Jainko is composed of *jaun*, *jain*, lord, master, a synonym of *jabe*,

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hone, bone	foni
ifuku, fuku, clothes	fohkah, to dress, nafohka, clothes
iya, not	ik
kokoro, kokochi, heart, feelings	chukush
kusami, stink	kosomah
mageru, to bend	bikullih
miko, prince	miko
rufu, spread, extend	hlapa
sakebu, to shout	shakapah
sammi, sour	homi
shigei, thick	shokkoh
shimesu, to moisten	shummichih
suteru, to reject	shittile-mah

THE SAME OF CHOCTAW AND BASQUE.

Choctaw.	*Basque.*
aïuhlika, power	al, ahal
alapalika, beside	alboan
baiullih, march	ibilli
banoh, bat, beka, only	banaka, apart, bat, one, bakar, alone
bikullih, to bend	makurtu
bohpolih, to sling	abal, habela, a sling
bok, river	ibai
bulbahah, to speak strangely	barbar
bushah, cut, mown	ebaki, epaitzen
chahah, high	goi
chipinta, very small	chipi, small
choluk, a hole	zulo
chukush, mind, heart	gogo
chula, a fox	azari, acheri
fala, a crow	bele
hoppih, to bury	hobi, a grave
ibawechih, to help	pabeza, help, support
ik, not	ez
illi, death, dead	il, hil
imah, to give	eman, emaiten
kaluffih, to scratch	karrapo, zarrapo, scratching
koffona, humpback	gupia
nukillih, to hate	nagatu
okpolusbih, dusky	uspel, discoloured by a bruise
okyuhlih, swim	igeri
olbul, behind	gibel
olubih, to take forcibly	arrapatu
shauwa, brushwood	zapar
ulah, to come	el, hel
ulla, child	aurra

The Choctaw furnishes an explanation of the Etruscan *subulo*, a flute player, which I compared with the Basque *chambolin* a player on the tambourine, in the verb *olah*, *olachih*, to play on an instrument. Thus, *ahlepah*, being indifferently a drum or a fiddle (I follow the lexicon of a native Choctaw, the Rev. Allen Wright), makes *alepah olachi*, a fiddler, and *ahlepahboli*, a drummer. This *olah*, *olachih*, must be the Basque *ola*, *olatu*, which now means and *goi*, *goya*, *koya*, high, elevated.[66] The Etruscan form *Goijaun* is more in accordance with the genius of the Basque language than the modern Jainko. The repeated *artu* is the common verb "to take, receive." Azpiko, literally, he who is under, now means a slave, but may refer to any subject or servant. The form *auretsa* is not modern Basque. It is apparently composed of *aurre* before, the French devant, and *etsi*, esteem. A word that may correspond is *aurkeztu*, to present, in which the inserted *k* may be simply euphonic. Probably *auretsá* means homage, the regard of one who presents himself before Deity. The *che* of *azpiko-che* may intensify *azpiko* in the direction of humility. It will thus answer to the Japanese humble prefixes *ki* and *hei*.

A somewhat difficult votive tablet follows, my object being not to present the simpler texts, but to give a just view of the inscriptions, with all their variations and difficulties.

272.	ΛADOI	baratu mai	zarratu mai
	ANCADNEI	rakachiratukanio	erruki jarritu ganio
	YVDINAM	Kupido uga rano	Cupid uga rano

Translation—The written tablet concerns an act of sympathy toward the mother of Cupid.

Here we find an act of worship towards Venus, the Istapeko of the Basques. The engraver has made a mistake in the first letter, which should be the corresponding *sa*, *za*.[67] The full form of *mai*, *mahi*, table, follows. In *raka* the root of *erruki*, *urriki*, sympathy, compassion, appears. That root I am convinced is the postposition *rako*, towards. It appears as a verb in the Eugubine tables, as does *rano*, regularly conjugated with the auxiliaries, to denote siding, sympathizing, agreeing, taking part with. *Jarri* means to set to,

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"to strike violently," and forms *olan-driko*, correction by blows. The Choctaw *ahlepah* is probably the same word as the Basque *chiribi*, *chiribiri*, a fiddle, which makes *chiribikar* a fiddler. The player is degraded to the position of a mere carrier of the instrument by the suffix *kar* from *ekarri*, instead of the old word *ola*, *olin*, *bola*, *bolin*.

The three languages employ different auxiliaries, and show much diversity in the use of pronouns, but their particles and construction are virtually one as well as their vocabulary. The Choctaw language, or that of the Tshekto as they call themselves, connects geographically with the Japanese through the Siberian Tchuktchis. The Basque, Japanese and Choctaws do not represent the dispersed of one tribe, but different tribes of a great national dispersion.

[66] The original Khitan word for lord probably ended in *mi*, like the Japanese *kimi*, lord, master, *kami*, god. The Corean word for lord, and master of the house, is *koun*. This seems to be the Etr. form *kaon*. As *kobe* became *jabe*, so *kaon* became *jaun* in Basque. A similar case is *joan* to go, sometimes pronounced *goan* and *gan*. In Etruscan it is *gune* or *goen*.

[67] Fabretti gives the first character correctly as L.

jardun, to be occupied, *jario*, to do. The old verb *rakojarri* may be represented by the modern *jarki*, *jarkitu*, to incline, lean, bend. What I have translated act of sympathy should be rather act of homage or worship. It is somewhat strange to find three postpositions of the same meaning, towards, in one short inscription, *rako* as a noun, *gan* as a verb, and *rano* in its legitimate employ. Certainly the goddess was well "towarded."

Still another tablet referring to this goddess combines the votive with the sepulchral.

35. OANA · YVP‡VNIA · CAYMLINIS · A (of a woman)[68]
marakara kupido Ichpeka ura Siraku ainza uka huno ara
marakara Cupid Istapeko aur Siraku ainza uga huno ara
monument Cupid Venus son (to) Siraku presents mother his, behold
A memorial, to the son of Venus, Cupid, Siraku presents his mother, behold.

Ichpeka, as the mother of Cupid, must be the Basque Istapeko, one of the few mythological names the Euskarians have retained.[69] There should be a postposition after *aur*, *aurra*. It is probably omitted to avoid the repetition of *ra*, which would be the postposition understood. The only word calling for comment is *ainza*. This I take to be a third sing. pres. indic. of *aintzi*, now *ainzindu* or *aitzindu*, to present, come before. The Etruscan almost universally gives shorter forms of verbs than the Basque; examples, *imi*, place, *ema*, give, for *imini* and *eman*.

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[68] This is given as corrected by Fabretti.

[69] It is but just to the memory of the Etruscans to say that the Cupid who figures so largely in their monuments was originally a very different person from the Greek Eros. The Indian Kings of Canouge, known as the Guptas, bore this ancient and honourable name, for Gupta, which appears on many Lats in Mathoura and elsewhere in northern India, is an oriental Cupid. These monuments are Khitan, as I have indicated. In mythology he is Iapetus rather than Eros, the son of Uranus, the grandson of Acmon, who, according to tradition (Steph. Byzant. s. v. Acmonia), founded Acmonia in Phrygia, and was a Scythian. In history he is Aahpeti, the Apophis of the Greeks, the greatest of the Hyksos or Hittite Pharaohs of Egypt. Coming to the throne as a child, he was afterwards associated with infancy. He left his name to the Cappadocians, recognized by Professor Sayce as a Hittite people. The fabulous history of Persia, as preserved by Mirkhond and Firdusi, strange to say, recognizes him as a king of Iran and all other lands, under the name Kai Kobad, mentioning his greatness, his virtue, his reign of a hundred years, and conversion to the Hebrew faith. In the Hebrew Scriptures he is called Jabez, or better, Igabets, the son of Zobebah, and grandson of Coz, who is set forth in I. Chronicles, iv., 9, 10, as a convert to the faith of Israel. See my article on Jabez in *British and Foreign Evangelical Review*, April, 1870. He was an ancestor of whom the most favoured nations of the earth might be proud.

Another votive tablet seems to refer to Alcmena.[70]

328. LAPO · 8EPINA zarratu ma · lanetu uga ra
FELVM aginza pino
Translation—Written tablet Hercules mother to presented I have

There is no doubt about *Lanetu* denoting Hercules, for that hero, with club complete, appears on many Etruscan gems bearing this name. As I have already stated, it is the Basque *landu*, *lanth*, work, labour. The Eugubine Inscriptions show that there was an officer in the Etruscan confederacy so called, whose duties are not defined. The only other thing that calls for mention in this inscription is the first appearance of the auxiliary verb *dut*, to have. In modern Basque, "I did," or the imperfect of *dut*, is *nuen*. The form *banu*, which is the *pino* or *benu* of the text, now means "if I did." But the present conjunctive was the old indicative form, as appears in the Eugubine Tables in many phrases, like *artubenion Arretigi nen*, I received him into Arretium. The Etruscans also expressed "he has" by *be*, which, in the form *bu*, is now imperative, "let him have." Banu occurs also in the following.

334. OAN⅃FILVM · CAIAL · EIN
marakagu egihatz pino Zerua eritsa ni uga
maragogo egihatz banu Zerua eritsa ene uga
memorial engraved I have Zerua honours my mother
The memorial I have engraved, it honours my mother Zerua

The form *maragogo*, to which I referred when dealing with No. 41, here replaces *marakara*. The second word *egihatz*, an inversion of *hatz egin*, to scratch, has also been before us in No. 2. The auxiliary *banu* stands in the same relation to this verb as that in which it stands to *aginza* in the preceding inscription. The pronoun *ene* is the Basque possessive, my.

The next inscription furnishes a different form of the auxiliary.

287.
OANIA . MAPCIA maraka harri · miratuchiura maraka harri miratuchiu ra
ΛEPSYIESA banetunokuune anre banetu nuqueyen andre
Translation—Indication stone Miratuchiu to ; joined would I had, the wife[71]

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[70] Alcmena is a name that might easily be taken for Etruscan. Alcman, the poet, was a native of Sardis, in Lydia, a Hittite region. The word Lucumo, which is 8INO, *alhaukamo*, is of the same apparent formation.

[71] I find the same proper name in Lanzi (No. 18).
LADOI · MAPCI · PIL TX
zarratu mai Miratuchiu du atso LX
It is on a woman's monument.

The form *maraka* or *marga harri* has appeared in note 40. The present word for join is *batu*, derived from *bat*, one. As we have found *bemo* or *pimo* to be the Etruscan form of *bat*, it is natural to find its compound in such a shape as *banetu* presents. This word is very common in the Eugubine Tables, where it is impossible to doubt its meaning. The auxiliary *nuqueyen* is the modern form of the 1st sing. past conditional of *dut*, I should have had. Here it must be read as precatory.

The auxiliary of the present tense, *pi* or *be* occurs in the following.

180. APNOIΛEYPV ⁚ ΛPΛYANIA.
artukamo u banekutu pi Batuba Kuraka ura
artugomu hau banekutu be Batuba Kuraka aur
memorial this communicate does Batuba Kuraka's child[72]

The word *artugomu* I have not met with in Basque, but it is a perfectly admissible form, from *artu* hold, and *gomuta* remembrance. I am in doubt about *banekutu*, which should mean to execute. Following the analogy of *batu*, *banetu*, I query *banekutu* as an old form of *bakidatu*, to communicate.[73] In the Eugubine Tables *be* is common for he has, does. The following presents *banekutu* with a different termination :

313. OVI · LAPO · ΛEYDNI · LADOALI
SA
Mopiu zaratu ma banekutu kau zaratu ma rasa u
nora
Mopio zarratu mai banekutu kio ; zarratu mai eritsa hau
andre
Mopio engraved tablet communicate does; engraved tablet honours his wife.

The only word to note is the final *kio* of *banekutukio*. It is the termination of verbs conjugated without auxiliaries, to which I referred under No. 20 in connection with *kanio*. The form *kio* is but a variant of *io*. It serves to mark *banekutu* as a verb in the third person singular, present indicative.

318. MA · MIYPAE   mira miukutura ne   mira Miukutura n
LAPOI · AS   zaratu mai rano   zarratu mai rano
Translation—Look towards the engraved tablet to Miukutura

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[72] Fabretti reads ΛPΛΛ instead of ΛPΛY. This would make the name of the parent Baraka

[73] Banekutu is certainly not *bankatu*, for not only does that mean to separate, which gives no sense, but it appears in the Eugubine Tables as *pimokatu*. The termination *kutu* is the

The final *en* of *Miukuturen* is locative and dative. I have inserted this tablet for the benefit of Basque students who assert that the verbs *miratu*, *miretsi* are borrowed from the Spanish *mirar*.[74]

435. LO · APNYNI · CALESA · ΛAYISLANIA
asma artukakukau Chirasane nora baraku unosaraka ura
asma artugogo kio Chirasane andre berek onetsirik aur
Translation—Indication, hold in memory does Chirasane's wife her dearly beloved child

Here we have a new but modern Basque word, not uncommon in the inscriptions, *asma*, a sign, trace, indication. The sign of person, and tense, *kio*, though following *gogo*, memory, belongs to the preceding verb *artu*, hold. The verb *onetsi*, to love, esteem, assumes an attributive form in *onetsirik*.[75]

441. OANIAΛEYPVI · ΛLANCVPIA · SΛLAYVP
maraka ura banekutupiu basarakachipituura nobasarakupitu
margaharri banekutupio fetchoraka chipitu aur ena fetchora Cupido
indication stone communicate to him does gentle little child to my gentle Cupid[76]

All the words in this inscription have already occurred with the exception of the auxiliary termination *pio*. In modern Basque *biu* means let him have. In Etruscan final *pi* or *be* means he has or does. But the Basque, like the Iroquois, has a wonderfully complex system of included pronouns combining with the auxiliaries or verb-endings. Thus *zayo* signifies he to him has, *dio*, he it to him has, *hau*, he thee has, *nau*, he me has. According to all analogy, *pio* or

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modern Basque verb *ekit*, as numerous examples testify. It may be an old form of *bakidatu*, to communicate, in the sense of offering, giving. The analogy thus appears: Bas. one, *bat*; unite, *batu*; communicate, *bakidatu*; separate, *bankatu*. Etr. one *pimo*; unite, *banetu*; communicate, *banekutu*; separate, *pimokutu*. These are among the comparatively rare instances in which the ancient word is larger than the modern.

[74] It is natural that lexicographers should seek the relations of the words they gather. It is also true that there are many French and Spanish words in Basque as now spoken and written. Yet many have been erroneously regarded as loan-words which are pure Basque. Such is *mira*, the Japanese *miru*. The same language has *so*, regard, equally with the Basque. The Basque *ikhus* is the Iroquois *ikkens*.

[75] See Van Eys, Dictionnaire Basque-Français, sub *ik*. United to verbal adjectives, it gives them the value of an ablative absolute, but the signification of *ik* is not always equally clear. When it is preceded by a vowel, euphonic *r* must intervene. If such explanatory notes are elsewhere wanting, it is because I have all along had Basque scholars in view, to whom the ultimate appeal must in any case be made.

[76] Fabretti reads V, the last letter but one of the inscription, as Y. There is much confusion between these characters. Sometimes V is made Y, and Y is made T. Whether Kupido or Kukuto, it makes little difference, as the word is a proper name.

bio should mean in Etruscan the same as *dio* in Basque, he to him, and it may mean that here. The difficulty, for such difficulties I desire to court rather than avoid, is that *fetchora Cupido* is preceded by *no*, which must be a first personal sign, although it is different in form from that which occurs in No. 334. There it is E, *ne*, *ni*, *ene*. Still I cannot see that it is other than the possessive " my " in an oblique or dative case.[77]

433. SINVNIA · LO · CICVS · ΛAΛANIAM · O
noukapikaura asma chiuchipino barabarakaurano . ma
nau gabeko aur asma Chiuchipi no barrebarrek aur no ema
he me has deprived child indication Chiuchipi of laughing child of give
My departed child ! to give an indication of the laughing child of Chiu
the little

This touching inscription exemplifies the Basque pronominal system in *nau*, he me has, but here employed interjectively, " child lost to me." The word *gabeko* is a compound of the postposition *gabe*, without, as a verb *gabetu*, deprive, be deprived. The words ending in *no* are in the genitive, rendered necessary, in the case of *aur* at least, by the fact of *asma*, which governs it, preceding. In *barrebarrek* we have an instance of the way in which some Basque superlatives are formed, as in Hebrew, by doubling the positive. It therefore means " most merry," although laughing is the literal translation.

I shall now give a number of simple inscriptions.

281. OA · CAINEI · CAN‡NASA
mara Chirau kanio Chirakaichkara anre
mara Zerua ganio Zerukoitchekira andre
memorial Zerua concerns Skyholder's wife

309.	FVSINE1	Agpinou kanio	Agpinou it concerns
	CAPCVSA	Zerutu chipi andre	Zerutu's little wife
		(or)	Zerutu-chipi's wife[78]

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[77] My amiable critic suggests too much elasticity in connection with *pio*. *Biu* is in modern Basque the 3rd sing. imperative = let him have. In Etruscan, V, *be*, plainly marks the third sing. pres. indic. of a verb to have, to do. Van Eys states that *b* is the characteristic of the third person (sub. *bere*, *biz*). This is not borne out by the Etruscan, which gives *banais* for *naiz*, *banu* and *banuen* for *nuen*, thus indicating that *ba*, or in Etruscan *be*, was recognized as an integral part of the auxiliary. Just as the English verb substantive is a compound of three original verbs, so must we regard that of the Basques. Like the Japanese, the Basque must originally have had several auxiliaries, the remains of which are to be looked for in the forms of *nais* and *dut* and in the terminations of the regular verbs.

[78] According to Fabretti, the final A of 309 is absent. In Lanzi, 70 and 71, the name occurs as FVISI Gipiunou, the wife of one Zuntzegin and the mother of another. If Fabretti be right, the *chipi* must mean "a little one" or child, but it leaves the final *no* unaccounted for.

383. F · YEYI · CAINAL
age kunekuu Zerua karasa
age Kunekoi Zerua sortze
behold Kunekoi Zerua *natus*

382. L · YEYI · SVSINAL
so Kunekuu Nopinou karasa
so Kunekoi Nopinou sortze
behold Kunekoi Nopinou *natus*

153. EINVLNEI · VNAYASA
ne uka pisa kanio pikarakura nare
ene uga Pisa ganio Begarakura andre
my mother Pisa it concerns, Begarakura's wife

210. LO · LICSCA
asma Sauchino chira
asma Sauchi no jarri
indication Sauchi of to make

211. LO · LICS
asma Sauchino
asma Sauchi no
indication Sauchi of

286. OANA · SENYIN marakara none kakuuka
EI · APYCESA nio Artukuchine nare
marakara non gogoi ganio Artukuchine andre
monument where memory in is regarded Artukuchine's wife[80]

94. FELIA · YEYINEI aginza oar Kunekoi ganio
aginza ura kunekuu kanio offering behold Kunekoi it concerns[81]

97. LADOI · FELNEI zarratu mai aginza kanio Arsakau eritza
ALNIAL written table offering concerns Arsakau it honours[82]

112. YIYE · FESIm Kuukune Aginno hume: Koiku to Aginno's child

96. L · CFENLE · CAVΛNAL (On the lid of an ossuarium)
so chiginekasane chirapiba karasa
so Chiginekasane Zerupiba sortze
behold Chiginekasane Zerupiba *natus*

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[79] Fabretti reads 210 LO · LRCS · CA, *asma Satuchi no jarri.* I am not aware how he reads 211, which in Lanzi corresponds. The word *jarri*, originally *chiri* or *cheri*, which in the form *jar* now means attention, is evidently employed here as *jario* is in modern Basque. Van Eys (sub. *jario*) says: "Jario correspond à 'faire' dans la phrase suivante: *kea dario*, il fume. Il est curieux que *eraunxi* qui est synonyme de *jario* soit employé en souletin pour 'faire' dans toutes sortes d'acceptions." Thus, *asma jarri* will mean, "to make indication."

[80] Fabretti reads the last group in 286:
AΛICESA *Arbaizen anre*, the wife of Arbaizen.

[81] Also he reads the second group in 94: YENINEI *Kunekai ganio.* I read *aginza oar*, the latter being the shorter Etruscan form of the verb *oartu*, perceive, consider. It is here imperative.

[82] No. 97 Mr. VanderSmissen informs me is an inscription on a vase, which seems inconsistent with the use of the word *mai*, now meaning table. I have already indicated that *mai* in Etruscan must be taken to denote a space, on whatever surface, set apart for delineation, like the Japanese *hi-mei.* Its root is the Japanese *ma*, a space or interval of space. In Fabretti the final l of FELNEI is made like a Greek lambda. This is the Corean *s* and appears for *sa* in Pictish. I do not know its Etruscan value.

253. OANA · FVISINEI · CAPCV (Ossuarium)
marakara Agpiunou kanio chiratu chipi
marakara Agipiunou ganio Zerutu chipi
memorial Agipiunou concerns Zerutu's little one[83]

29. LADOI · CPACNEI · LAPISAL · PIL · TXXV
zaratu mai Chiturachi kanio zaratu onerasa tuusa LXXV
zaratu mai Chiturachi ganio zarratu oneritsa eta atso LXXV
written table Chiturachi concerns; the writing honours his years LXXV[84]

62. AP · YINM · AP · CA8AYIAL
artu kuukano artu Zerulurreko urasa
artu Goijaun artu Zerulurreko auretsa
accept Jainkoa accept Zerulurreko's homage

70. LADOI · FVISINEI · LECNESA
zaratu mai Agpiunou kanio sauechikane nare
zarratu mai Agpiunou ganio Zuntzegin anre
engraved table Agpiunou concerns Zuntzegin's wife

71. A · LECNE ara · sanechikane ara Zuntzegin
FVISINAL Agpiunou karasa Agpiunou sortze
Behold Zuntzegin Agpiunou *natus*

77. LAPIS · FEYE · APNO
zaratu huno agingune artukamo
zarratu huno Agingune artu gomu
inscription this Agingune (of) holds memory[85]

78. LAPIS · FEYE zaratu huno agingune zarratu huno Agingune
APNOAL artukamorasa artu gomu eritsa
inscription this Agingune (of) holds memory esteemed

79. LAPO · FEYE · ADNOAL zaratu ma agingune artukamorasa
FIΛINALC agubau karasa che
zarratu mai Agingune artu gomu eritsa Agubau sortze che
written table Agingune (of) holds memory esteemed, Agubau *natus* even

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[83] Fabretti gives a different reading of 253:
OANA FVP NE · L · CAPCV
marakara Gipitu kane so Zeruta chipi

I have already drawn attention to the formula FVISINEI in Lanzi 70 and 71. If Fabretti be right the missing character should be I making INE *ukhan*, meaning to be or to have. The inscription thus would read: "the monument Gipitu has; behold Zeruta's little one."

[84] In 29 *oneritza du atso* honours he has age, is obviously incorrect. As previously suggested (page 186) I have taken P as *eta*, a root form of *etan*, *etaz*, *etara* or *hetan*, *hetaz*, *hetara*. In how far this is justifiable, a fuller knowledge of Etruscan alone can indicate.

[85] Fabretti adds AL to this inscription (Lanzi 77), and thus makes it identical with 78.

81. ADNY · FEYE . APNOALISA artukaku agingune artukamorasaunora
CAIAM chirau rano
artugogo Agingune artugomu eritsa hau andre Zerua rano
to hold memory, Agingune memorial esteems his wife, Zerua towards

86. LADOFEYKADN zarratu ma agingune artuka
OALISAOVILAD mo rasa u nora mopiu zaratu
OFEYELINE ma agingune sau kane
zarratu mai Agingune artugomu eritsa hau andre Mopio ; zarratu mai Agingune zayo egin
written table Agingune holds memory esteemed his wife Mopio ; the written table Agingune he to her makes. For *kane*=*egin*, see note 49 a.

The following are examples of the use of *eragin :*

83. LADOI · ANE · LIA · FEYESA
zaratu mai erakan saura aginkune anre
zarratu mai eragin Zauri Agingune andre
written table causes to be made Zauri, Agingune's wife

260, although coinciding with 83, is an independent inscription.

315. LO · MAPICANE · FIACIAL
asma miratuuchi rakane giurachiurasa
asma Miratuuchi eragin Giurachio eritza
indication Miratuutsi causes to make Giurachio it honours[86]

196. SENTI · ALCHV Fabretti C · SIINTI · ALCHV
CLIIPATRVS CLII𐌐ATRAS

These readings are very different :

nonekakuu rasa chikapi	chi notekakuu rasa chikapi
chisateturakutupino	chisatebarakuturano

I accept Fabretti's emendations with the exception of the initial C and the II following S in the upper line. These may be correct reproductions of the originals, but in any case they are not in accordance with Etruscan formulas. The C I accept as a modification of F in its square form like a Hebrew *beth*. The II I read E with Lanzi.

F · SENTI · ALCHV
CLII𐌐ATRAS
age none kakuu rasachikapi
chisate barakuturano

Basque—Age non gogoi eritza Chikapi sista (ezezta) borrokatar no
Indication which memory in esteems Chikapa pierced (is no more) warrior of

---

[86] 315 is given as restored by Fabretti.

The word *borrokatu*, now meaning "lutter" in French, occurs frequently in the Eugubine tables with the signification "fight." I know of no modern word *borrokatar*, the termination *tar* being reserved for ethnic designation as in *Burgostarra*, a native of Burgos. But, as I have elsewhere indicated, there is a surviving instance of its more general use in ancient times furnished in *anaitar*, fraternal, from *anai*, brother. Another word which can hardly be called ethnic is *goierritar*, a highlander. In the Eugubine tables *goitar* appears, meaning a commander, one who is above. This word *borrokatar* is in the genitive to the postposition *no*. The main difficulty is the *sisata, chisata*. If it represent *sistatu* to pierce, *ka*, by, should replace the postposition *no:* if it represent *ezeztatu*, the *no* has still to be accounted for. Now in Basque (Lecluse Manuel p. 88) the negative nominative ending in *ic* may be considered as partitive. Thus *ez da guizonic* instead of *guizon*, the affirmative form, must be translated "il n'y a pas d'homme." This *ic* the Etruscan replaced by the genitive *no*. Thus *Ezezta—no* is "actum est de."

434. OANA · FELNEI · LAFCINASA[87]
AYAYIYIAL
marakara aginza kanio saragichiukara anre
rakurakuukuurasa
marakara aginza ganio Saragi Chiukara andre
irakurri koikoi eritza
memorial offering concerns Saragi Chiukara's wife
reading (writing) dearly esteems

The word *irakurri* means to read, but is here used in the sense of that which is to be read. After it comes the superlative *koi-koi*, from *koi, khoi*, desirous, fond.

353. AYALE · FILIAM · LAVYNI
rakurazune agiusaurano zarapikukau
irakurri zuen Egihatz ura no (Egihatzau rano) zarrapo egokio
read ye who Egihatz child of (Egihatzau towards) writing concerns

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[87] Fabretti gives an entirely different version of 434.
OANA/FINEI · LAFCINAS · AATAINAL
marakara bagiukaneu saragichiukarano rarakuraukarasa
As the two copies differ so much, I may be permitted to suggest slight alterations.
OANA/FINEI · LAFCINAL · AF(R)TAINAL
I have changed S at the end of the second group to L, and the second A of the third group to F or R. I thus read:
marakara Bagio ganio saragichi ogoi arsa irago (artu) Kurau sortze
monument Bagio concerns thrice twenty years passes (leads) Kurau *natus*
If we read according to Fabretti, it will be:
monument Bagio concerns Saragichi mother towards Arrakurau *nata*
This is not a probable legend; hence my suggested changes.

I have indicated a doubt as to the reading of *Egihatzurano.* The word *zuen,* as far as form is concerned, might be the 3rd person sing. imperfect indicative of *dut,* meaning he had. But here it is plainly the personal pronoun *zu* with the relative particle *en,* ye who. In *zarapi* we have, I think, a variant form of *zarratu,* answering to the modern *zarrapo.* Of course it might, if the first reading is the true one, be Servius, the son of Egihatz. The last word is good Basque of to-day, *egokio,* il importe.

The inscription that follows seems to refer the reader to another :

316. OI · LOTIS · SEPYVPVS · LAPYNAYA
mai asmaku uno none tukupitupino zaratukukarakura
mai asmaku hune non adiko bethe banu zarratu egoki irakurri
table traced this where explained fully I have writing capable read
Let him who is capable read the writing of the inscribed table in which I have given particulars.

Here a distinction is well drawn between writing and reading. The Etruscan *adiko* is a derivative from *adi,* understanding, knowledge, which makes *adigarri,* signification. The word *bethe* means full in Basque. Besides the meaning "*importer,* concern," *egoki* also denotes *à propos, capable.* It may of course mean in this place "whom it concerns."[87a]

I have already in 96 given a tablet of the Cecinna family, which name I have roughly read Chiginekasune. Roman writers call it Caecina. Sisenna is doubtless the same word. Whether *Kasune* is the nomen or cognomen I am not in a position to judge. If it answers to Zuntzegin, as an abbreviation and inversion of that name, it will be the nomen, for we learn that the Caecina whose case Cicero advocated belonged to the Licinian gens, and Zuntzegin we have found was the Etruscan form of Licinius. The following are other monuments of this familia. They were found at Monte Aperto of Siena ·

89. OANA · MEOINE . **marakara Minemo ukane (ukan)**
CFENLESA **Cegine kasune anre**
memorial Minima has Cecina-kasune's wife[88]

[87a] Tuku may be a proper name as it is in a similar inscription : Bilingual, Fabretti 934. In this case *pitu, betu* will be the Etruscan form of *epatu,* to fix, set to. See Tomb of Sarapikuka, line 1.

[88] The iconoclastic Fabretti with a rude hand destroys the Cecinna memorial in 89. Here is his reading :

OANA · MEOLNE CELN
marakara minemosakane chinesaka

The word *ukan*, *ukhan* is Basque, having the double meaning of have and be.

90. AV · CFENLE · mEOL · NAL
rapi ceginekasune Minemosa karasa (sortze)
behòld Cecina-kasune Minemosa *natus*

For *rapi* see inscription Lanzi, Vol. II., p. 421, No. XI.

91. LADOI · CFENLE · mEOLNA
zarratu mai Cegine-kasune Minemosa kara

This is virtually the same legend as the preceding, and seems to show that the Cecinnas married into a family of Minimas. It lacks the final L of *sortze*.

93. LA · CFENLE · OA
zari Cigine kasune mara
commander Cecina-kasune Mura

The first word, which occurs frequently in the Eugubine Tables to denote a general, commander of an army, is the Basque *zari*, generally compounded with *agin*, command, or *buru*, head, *aginzari*, *buruzari*, chef, commandant. I do not think that OA here denotes a memorial in the genitive of position to Cecina-kasune, but the name Muraena borne by three of the Licinii who fought in the service of Rome.

95. LADO · CFENLE   zarratu mai Cecina-kasune
𐌐A𐌐A   barabara

The last word may be *buruburu*, meaning great chief, as *buru* denotes a commander or chief as well as a head. I know of no verb that would complete a sentence of this form except *para*, to place or present. The inscription reads *zarratu mai*, the written tablet *Cecinna-kasune parapara;* making it appear that *zarratu mai* is the nominative, *Cecinna* the accusative of *parapara*. If we were told that a portrait of Cecinna adorned the tablet, I should read *buru para*, presents the head. As it is, it must for the time remain a mystery. This will be no hardship, as all its companion inscriptions have been such for probably eighteen centuries.

If Lanzi manufactured his inscription out of this he must have been a very dishonest man, although he has generally been regarded in a totally different light. The thing is incredible. This is no complete inscription, but a fragment. However, Fabretti is right in reading mEOL, instead of mEOI, as the following inscriptions 90 and 91 testify. Instead of *ukan* we must read *kane*, makes. As for *chinesaka* or *zein so ka*, who look by, freely, "who or which by the sight," although such forms do occur on Khitan monuments, it is obviously out of place here.

99. LA · CFENLE · 8VYNI
zari ciginekasune alpi kukau
zari Cecinakasune alaba egokio
commander Cecinna-kasune's daughter it concerns[89]

I have already given in Nos. 70, 71 two inscriptions of the Zuntzegin family in addition to that contained in No. 5 bilingual. As this is the true Licinian line, it may be interesting to study other inscriptions of the same family found at Senese.

67. OAN⅃VFIL · SESCYNEI
LECNESA
marakaku begi usa none nochikukanio
sanesikane anre
maragogo begi batz non Nosiku ganio
Zuntzegin andre
memorial regard where Nosiku is concerned
Zuntzegin's wife

The only new word *begihatz,* composed of *begi,* the eye, and *hatz,* now *atzen, atzitzen,* seize, has in modern Basque the form *behatz,* regard, consider.

68. OAN⅃FIL . 8PEΩNEI[90]
YEFAYNAL
LECNESA

marakagu giusa altunebakanio	maragogo egihatz Altuneba ganio
gunegiraku karasa	Gunegiraku sortze
sanesikane anre	Zuntzegin andre

memorial regard Altuneba concerning, Gunegiraku *nata*
Zuntzegin's wife

In this inscription *begihatz* is abbreviated to *egihatz.* Altuneba seems to bear a foreign name. In all likelihood Gunegiraku is the name of her birthplace.

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[89] Fabretti reads the last character as A.
LA · CFENLE · 8VYNA
zari ciginekasune albe kukara
zari Cecinna-Kasune alaba Kukara
commander Cecinna-Kasune's daughter Kukara

No. 44 gives Kukara as a man's name. Perhaps the names answer to one another as Licinia to Licinius.

[90] Fabretti omits I at the end of the second group in 68, making *kane,* makes, instead of *ganio,* concerns. Or it may be the simple postposition *gan,* towards.

[90a] There is not much variety in the following inscriptions belonging to the Licinian or Zuntzegin family, but they are useful as showing that NAL and NIAL are variant forms of the same word.

69. LO · TITEI · LE	**asma kuukuneu sane**
CNESA	**chikane anre**
CAINAL	**chiraukarasa**

asma Koikunei Zuntzegin andre Chirau sortze
indication Koikune to Zuntzegin's wife Zerua *nata*

Chirau or Zerua is probably a woman's name here as it is in many inscriptions. Koikune is in the dative case marked by i or ari.

The following contain words indicating relationship:

88. LADY · EC · NAYNA · A/INA
zaratuku nesi karakukara arbaukara
zarratu toki anzi Karakukara arreba hau ekarri
written place prepares Karakukara sister his to bear[91]

The second word *toki* is Basque "place." The *tu* of *zarratu* is made to do double duty. In *arreba* we have the Basque word for sister of a brother; the sister of a sister is *ahizpa*. The other words have already been considered.

Fabretti 402. F · LECNE · ՈADCNAL
age Zuntzegin Baratuchi sortze
behold Zuntzegin Baratuchi *natus*

403. FEL · LECNE · FISCE · ՈADCNAL
aginza Zuntzegin agiono Sena Baratuchi sortze
offering Zuntzegin well presents Sena, Baratuchi *natus*

For *agiono* see Bilingual Fabretti 69, HEYMFIS. It is a compound of *agin*, to offer, and *on*, good, kindly presents. For CE as Sena see the long inscription on the Tomb of Sarapikuka.

404. A · LECNE · A · AՈONIAL
ara Zuntzegin ara Rabama sortze
behold Zuntzegin behold Rabama *natus*

If NIAL be not the same as NAL it must be *kio eritza* where *eritzi kio* would be expected.

Compare 413 F · LECNE · AՈONIAL
age Zuntzegin Rabama kaurasa

and 407, which exhibits the commoner form:

LO · TITEI · LECNESA · CAINAL
asma Kuikunei Zuntzegin andre Zerua sortze
indication Koikune to Zuntzegin wife Zerua *nata*

But again the long form appears in:

410. A · LECNE · FVISIHIAL · AP(NO)AL
ara Zuntzegin Agpiunou sortze artugomu eritza
behold Zuntzegin Agbiunau *natus* memorial honours

411. F · LECNE · F · SESTHAL
age Zuntzegin age Nonenoku sortze
behold Zuntzegin behold Nonenoku *natus*

If the first character of the last group were C instead of S, it would be Senanok, which followed by NAL appears on the tomb of Sarapikuka. Nonenoku is an unlikely name.

[91] 88 is given as restored by Fabretti. It does not necessarily follow that *to* of *toki* does double duty, inasmuch as the final *tu* of *zarratu* is not a necessary part of the word.

248. AVLE · VLOE · FELNA
rapi sune pisa mone aginsakara
arpi zuen Pisa amona aginza akar
behold ye who Pisa's mother offering bears[92]

The only word to note is *amona*, a dignified name for mother. Pisa must be a feminine name.

322. ADNO	artukamo	artugomu
LADIC · CALEC	zaratu utzi chirasa nechi	zarratu hitz Chirasa nechi

holds memory written word Chirasa's daughter

The word for daughter is now *nesca*, a less dignified term than *alaba*. I have read IC as *hitz*, word. In the Eugubine Table *hitz* is represented by K.

266. OVMVNEI	mopinopi kanio	Mopinopi ganio
8VLNI	alpisa kau	alabichi kiko

Mopinopi it concerns, daughter for.[93]

The postposition *kau* occurs frequently in the Eugubine Tables, as in *eman dio pabe kau*, give he him does help for, where it can mean nothing else than for. It is thus the Etruscan representative of the modern Basque *kiko*.[94]

269. AO · Cp	rama chitu	erama Chitu
ESΛE	nenobane	ne nebi ne
AΛIAS	rabaurano	arreba hau rano

it brings Chitune brother to sister his towards
Freely—It brings to Chitune's brother the memory of his sister.[95]

There are two new words here. The first is *erama* from the Basque verb *eraman*, cause to give, or bring. The second is *noba*, now *nebia*, brother, although *anai*, *anaya* is the commoner form.

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[92] Fabretti inserts an archaic S between *zuen* and *Pisa*. This will make the name Nopisa. *Ekarri* should read *akar*, as *dakar* is the 3 sing. pres. ind. of *ekarri*. Etruscan does not prefix the d.

[93] Lanzi represents this inscription, which is boustrophedon, with the lower line upside down. Fabretti reverses the order by inverting the upper line. He also gives instead of V in the lower line a heart-shaped figure.

[94] I have been asked how I get *kau* or, following the analogy of the verbal termination, *kio*, out of *kiko*, which is supposed to have been originally *kinko*. I do not assert that they are the same words, but that a resurrected Etruscan would replace his *kio* by the Basque *kiko*. The Iroquois uses *ke* to signify "for."

[95] In Fabretti the 8 of line 2 and Λ of line 3 are irrecognizable. The word *noba* is disappointing in form. Nebia, the modern word, would be better represented by EV. It has few near relations, the closest being the Georgian *muchbe* and the Choctaw *nakfi*, the brother of a sister.

141. FIΛA ATINANA[96]	age oba ra argo uga rakara
ANOAPEM	arka moritune no

age obi ra Argo uga rakora Arka Moritune no
behold grave to Argo mother sympathy Arka Moritune of

The word *obi* means a grave or tomb. Anciently it seems to have been *oba.* The construction of the sentence is imperfect in that no postposition follows *uga.* As for *rakara,* it was originally "a towarding," and the foundation of *urikarri, urrikal, erruki, erukiorra,* and other words expressing sympathy. Arca Moritune was a family name at Monte Pulciano, for the following inscriptions contain the name:

139. AVLE · ANOADE
arpi zuen arka moritune
behold ye Arka Moritune

140. ADNY · AN	artukaku arka	artugogo Arka
OADE · LAD	moritune zaratu	Moritune zarratu
OAL	ma rasa	mai eritsa

hold memory Arka Moritune, the written tablet honours

151. OIPINI · OEPIMAL
ma uta ukau monetaume rasa
mai aita uga hau Moneta hume eritza
table (in which) father, mother his Moneta's child esteems

In this inscription *eritza* should be *eritzate* if *aita uga* are the subjects, but *eritza* is correct if the child of Moneta is the honourer of his parents.

84. OANAVKALNEI
LADISAL CEYEMΛVIA
marakara piuchirasa kanio
zaratu uno rasa chinekuneno bapiura
maragarri Behatzeritsa ganio
zarratu hune eritsa Agingune no babe aurre
memorial Behatzeritsa concerns
writing this honours Agingune of grandfather[96a]

As this inscription occurs among those of the Agingune family of Senese, the C of the second line should be F. The only word calling for explanation is that translated grandfather. It is *babe aurre,* consisting of *babe* father and *aurre* fore. The Basque word for forefathers, ancestors, is *aurrekoak*, but *babeaurre* is not a modern Basque word.

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[96] 141 is altered to suit Fabretti's reading, whether right or wrong.

[96a] In Fabretti the K of the upper line is read Y, and the C of the lower F, as I have suggested. The name is thus Bekurasa. If Fabretti be right in reading the V of the lower line as L, we have *basa ura* = *fetcho aur,* darling child, instead of *babe aurre.*

38. LAPOI · SEIANYI · 8PAVNISA · AYIV · /IVYE · M
zaratumai noneurakakuu loturapikaunare rakuupi bahipikune no
zarratu mai non orogogoi Loturapika au andre Arkoibe bahi bakan no
written table where remembers Loturapika his wife Arkoibe consort
only behold

I have already directed attention to *bahi*, a pledge or engagement, as an Etruscan term for wife or consort. It is here followed by *bakan*, *bakhan*, only, which the Eugubine Tables represent by the same form *pikune.*[97] Its use may indicate that the Etruscans were usually polygamists. The final *no* is a particle meaning "tiens!" hold! here! take it! look! when addressed to a woman; when addressed to a man, it is *to*.

36. AYVSNEI · CA8AYES
arkupino kanio chiralaraguneno
Argubena ganio jarri alargun no
Argubena it concerns attention widower of
It concerns Argubena, the gift of her widower[98]

Already *jarri* has been before us. It means attention, as in *jarramon* or *jar eman*, give attention. The modern Basque word for widow is *alargun*, and there is no other term to denote widower. The statement of Lanzi that this is a woman's epitaph necessitates the reading of the latter.

114. FŁL · YIYEM · FESIM · ApNOIAL
aginza kuukuneno aginoi no artukamo urasa
aginza Koigune no Aginoi no artu gomu hau eritza
offering Koigune of Aginoi of memorial this esteems
The memorial of Koigune : this memorial of Aginoi esteems

163. AVLA · CVS/EDIENA
arpisara chipi nobane tuunekara
Arpisari chipi nebia n dio nigar
Arpisari little brother to she him does weep
Arpisari weeps for her younger brother[99]

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[97] The present Basque word for only is *bakar*, Now, *bakan*, *bakhan*, *bekhan* means "rare." Japanese agrees with Basque in *bakari*. The Choctaw has *beka*, probably the root form.

[98] Fabretti replaces final S with M, but without thus affecting the sense. In a note on this inscription Lanzi mentions the presence of LAPOI, so far read *Larthi*, and held to denote "a prince," in inscriptions accompanied by portraits of women.

[99] In 163 I read Arpisari as a feminine name, for the following reason : In most of the Khitan languages not only was a distinction drawn originally between elder and younger brother and

All the words, with the exception of the proper name, which may be feminine, and *nigar*, meaning tear, and with the verb *nigar egin*, weep, have already been before us. The auxiliary is represented by *dio*, he, she, it, to him does. The inscription came from Perusia.

339. AO · CAPNA · AO · PESYVMIA
erama chiratukara erama tunenokupinoura
erama Chiratugarri erama dena Nokupino aur
it bears Chiratugarri it bears him who is Nokupi of the child

The verb *eraman*, porter, supporter, emporter, emmener, is now in the third singular, indicative present *darama*. The prefixed *d* must be modern. It never appears in Etruscan, either with *eraman* or with any other verb. In *dena* we have the third sing. indic. pres. of *naiz*, namely *da* combined with the relative *n*, he who is. The latter name may be Nokupino, in the genitive of position with *aur*.

264. 8ASYIA	luranoku ura	lurrenko oar
CAINEIP	zerua kanio tu	Zerua ganio de-
ESCIVNIA	ne Nochiupika ura	-na Nochiupika ura

earthen vessel behold Zerua concerning who is Nochiupika's child[100]

This presents the same form as 339 but introduces a new word, *lurrenko*, the abbreviation of 8ASYI, *lurrenokuu*. Instead of this, OASYI, *maranokuu* frequently appears. This latter must denote a stone vessel, and the former one of earth, from *lurre*, earth. In either case *no* is the genitive, of stone, of earth. The final *kuu*, *koi* should be a vessel of some kind. It may be the original of *kaiku*. *khotchu*, vase, now generally applied to denote a milk-pail. Unhappily Lanzi does not indicate on what kind of surface the inscription appears. It may be that of a tile, urn, tombstone, &c.

289. ANAINEI · LAYIOESA
rakarau kanio saraku u monenare
urrikali ganio Saraku hau amona andre
regret in regards Sergius his mother lady

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sister, but also between the brother of a brother, the brother of a sister, the sister of a sister, and the sister of a brother. The latter distinctions have in many cases become obscured, but traces of them everywhere remain. Thus in Basque *arreba* is the sister of a brother, and *ahizpa* the sister of a sister. I am not aware that any such distinction marks the use of *anai* and *nebia*, the two terms for brother. Yet, according to the analogy of the Choctaw *nakfi*, brother of a sister, *nebia* should denote the brother in his feminine and *anai* in his masculine relations.

[100] Gori reads 264 : SASYYA
CAINEIIP
ESCIVNIA

The second Y of line 1 is so faint as to make it doubtful that it is the same character as that which precedes. I can make nothing of this reading.

The first word, which is really a form of *rako*, towards, I have already set forth as the original of many modern Basque terms denoting sympathy. It is in an old dative or ablative case synonymous with that in *n*, and answering to the modern locative. The dignified title, lady mother, is now shortened to *amandria*.

374. OANA · APYNEI · LO	marakara artukokanio asma
MALINAL	naresaugarasa

marakara Artuko ganio asma andre sa uga eritsa
memorial Artuko concerns indication wife and mother's esteem

Here *sa* is the shortened form of *basa*, and, both forms of which have already been met with.

423. AVLE · SEIANYI · MINV	arpisune noneurakakuu noukapi
LAPOAL · FISCVSA	zaratumarasa agiunochipinare
CLAN	chisaraka

arpizuen non orogogoi naugabe; zarratumai eritsa Agiunochipi andre. zazu erruki
behold ye where memory in it me has deprivation; written table honors Agiuno little wife. have compassion
Behold where my bereavement is held in memory. The engraved tablet honours the wife of Agiuno the little. Have sympathy.[101]

Every word in this inscription has previously occurred, except the last. This is the *clan*, filius, of the Etruscologists, which has sent them on a wild goose-chase over the world. It always stands out distinct from other words, while terms of relationship generally adhere. It means have pity, compassion, sympathy, being the second plural imperative of *dut* united to *erruki*. The following prayer of a votive inscription illustrates it.[101a]

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[101] Fabretti reads 423, thus:

AVLE · SEIANYI · MI	arbezuen noneoragogoi nou
LAPOAL · YISCVSN	zaratumarasa kuunochipinoka
AL · CLAN	rasa chisaraka

arbe zuen non orogogoi nau zarratumai eritza Goino Chipino sortze zazu rako
Behold ye where remembrance in he me has: the engraved space esteems Goino Chipino *natum*. Have sympathy.

There is evidently something wanting at the end of the first line.

[101a] Mr. VanderSmissen has sent me an inscription containing another form of this request for sympathy. It was found at Volaterrae:

abretti, 254. A · YIYE · A · CALE · CLANYL · AAVNAM · PIL · XXIIIX
ra kuukune ra chirasane chisarakakusa rabapikarano tuusa 27
ara Koikune ara jerri zuen zazu erruki ikusa Arbapika rano du atso 27
Behold Koikune behold present she did; have sympathy looking Arbapika towards. He has age 27.

57. FEL · YINM · AP · LVNCIAL · CLAN
aginza kuukano artu aspikachi urasa chisaraka
aginza Goijaun artu azpiko che aurketsu zazu erruki
offering Jainko receive servant even homage have compassion
. High Lord, receive the offering; have compassion for the homage of thine unworthy servant.[102]

The following have topographical connections:

102. ADNO · APNYLE
FESCV · AL8NAL · CLA
artukamo artukakusane
aginnochipi rasalakarasa chisara
artugomu artugogotzen
Aginno-chipi Rusella sortze zazu erruki
Memorial to hold in memory
Aginno the little (Aginno's little one) Rusellis *natus;* have sympathy

In this inscription the full form of the verb *gogotzen,* now *gogoratzen,* appears. This is also the Japanese *kokoro-su,* with the same meaning. Rasala is more probably Rusellae in Etruria than a woman's name. The formula *zazu erruki* is deficient in the last syllable.

107. AO · LAPCNA · YVYNAL
erama zaratu Chikara kupiku karasa
erama zarratu Chikara Kupiku sortze
bears writing Chikara Kupego *natus.*

I do not know what city the Etruscans called Kupego.[103] The name appears on the coins in Lanzi, Vol. II., plate ii., and has been

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The verb *ikusi,* to see, follows *zazu erruki,* and must be translated seeing. The Etruscan must have been read *kusa, kuso, kusu,* rather than *kusi.* The regular form of the auxiliary *zuen* appears instead of the common VS *benu.*

[102] No. 57 is amended, according to Fabretti, by the omission of F, which in Lanzi intervenes between the second and third groups.

[103] Some difficulty will be found in identifying names of places as they occur on the monuments, for they certainly must have been other than those given by the Romans if the Etruscans were an Iberian people If *clan* be an Etruscan word, such also may Clusium be. But Clusium is not Iberian, nor Florentia, nor Trossulum, Caletra, Vulsinii. In the Eugubine Tables Luna is Luni, and Volaterrae has no *t* nor any connection with the Latin *terra:* it is Baulaherri Arretium is Aretigi or Aretiag, and the final *nia* of Vetulonia and Populonia appears to be no part of the original. There is no evidence that the Etruscans had the letter *v*, as in Vulsinii, Volaterrae, Vetulonia. Some places in Etruria mentioned by Pliny (H. N., III., 8) bore Latin names, translations of the originals, such as Castrum Novum, Novem Pagi, Hortanum, Lucus Feroniæ, &c. It is hard to say how far this process of disguising may have gone on. A similar process of transformation is taking effect in our own Northwest, where Indian names are translated into such uneuphonious English terms as Moose Jaw, Pile of Bones, Medicine Hat. But for this process, as applied by the Romans, a study of Etruscan topographical names would long since have evidenced the Iberian origin of the people of Etruria.

wrongly read Tuder, which was an Umbrian city and Celtic, as its very name denotes, even to the student of English history.

317. LADCE · LADNI · CALEILADOI · MVDYVEONEI
zaratuchine zaratukau chiras aneu zaratumai nopitukupinemakaneu
zarratu zein zarratukio Chirasaneu zarratu mai Nepete jabe ne ema ganio
writing which write he does Chirasanio written table Nepete of lord
to give pertains.[104]

This does not look like an epitaph, but rather a communication of some kind. in *zein* we have the interrogative, but as *zena* it is relative. The Basques even now like to be known not by their family name but by that of their house or land, be it a hovel or a garden patch. The lord of Nepete, however, was the chief man of no mean city.

The next is instructive as presenting Kupiku with the dative sign, and *ganio* instead of *sortze*, showing that *ganio* may signify "belong to."

109. EL · LAPCANA · LO · YVYINEI
ansa zaratu Chirakara asma Kupikuu kanio
antsa zarratu Chirakara asma Kupikoi ganio
keeps writing Chirakara of sign Kupiku to he belongs[105]

370. L · YEYINA · F · YVSNV
YNAL
so kunekuukara agi kupinokapi
kukarasa
so Gunekoi ekara age Kupinogabeku sortze
behold Gunekoi it bears ; behold Kupinogabeku *natus*

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[104] Fabietti reads 317 very differently :
LADCE · LADNI · CALE LA[A]DOI · MVDMEONEI
zaratuchine zaratukau chirasane zara(ra)tumau nopitunonemokaneu ·
zarratu zein zarratu kio Chirasa ne zarratu mai Nopitu non ema kanio
writing which write he does Chirasa to written tablet Nopitu who give to him did

I have given a literal translation, but the sense is far from clear. Nopitu may not be Nepete, if this be the true text. I have rendered *kanio* as "he to him did," following the analogy of *kau*, *nau*, *dio*, *zayo*, including pronominal auxiliaries. It is thus a compound of the regular termination of the imperfect *kian* and *o*.

[105] Fabretti's reading of 109 is :
FL · LAPCANA · LO · YVY * * * L
agi so zaratu chirakara asma kupiku——sa
egi so zarratu jar ekara (dakar) asma Kupiku
look writing attention brings indication Kupiku

The lack of three characters leaves the sense to seek. For the first, *so egi* would be more in accordance with modern usage. The verb *ekarri*, in the 3 sing. pres. indic., would be *dakar*. As I have elsewhere indicated, the initial *d* of such verbs is not recognized in Etruscan.

The literal meaning of Kupinogabeko would be "deprived of a commander or chief or lord," and would suit some republican community.

381. OANA	marakara	marakara
OALYVNEI	marasa kupi kanio	Marasa jabe ganio
NVNIAL	kapika hu rasa	gabeka hau eritsa

memorial Marasa's lord concerns ; departed his it honours

398. AVΛVLSVYINA · AV · CALISNAL
rapi bapi sanopi kuukara rapi chirasauno karasa
rapi babe Sanopi Goikara rapi Chirasauno sortze
receive father Sanopi High Lord receive Chirasauno *natum*

This is sepulchral and votive. The author prays Jainko, here Goikara, the Tina or Jupiter of the Etruscologists, to receive his father, Sanopi. I do not propose at present to enter upon the identification of Chirasauno and other names of places.

The following presents a new formula:

407. LA · SENYINAYE · AOVNIAL
zara nonekakuukarakune ramopikau rasa
zara non gogoi ekara gune Ramopikau eritza
writing which memory in bears us to Ramopikau it esteems[106]

In this case *zara* cannot be *zari*, chief. In *gune* we see the pronoun in an old dative form. It is now *guri*. In these inscriptions *non* seems to read as a relative as well as the adverb where, which has sometimes relative powers. In such case the verb may dispense with the passive form, "which in memory bears to us."

130. AVLE · mADCNI	arpisane miratuchikau
ADNO ALISA	artukamo rasaunare

arpi zuen Miratuchi kiko artu-gomu eritsa hau andre
behold ye who Miratuchi for memorial honours his wife

184. AVIVP8	rapi upitula	arpi obi tille
SECSYIN .	none chinoku uka	non Chinoku uga
AL	rasa	eritsa

Behold the sepulchral inscription which honours the mother of Chinoku

In Basque *obi*, *hobi* is the grave, and *tille*, an inscription.

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[106] In 407 Fabretti omits the final AL, *eritza*, which makes a better reading : "Writing which bears Ramopikau to our remembrance."

347. LAPOA8VNEISEOPESA
zaratuma ralapi kanio none matune nare
zarratu mai Ralapi ganio non ematep andre
written table Ralapi concerns which gives wife.[107]

The verb *ematune* may be *ematen*, the simple attributive form of the verb *eman* give, or *ema duen*, give she did, now *eman zuen*. Much study and careful comparison of texts will be required to settle the differences between the Etruscan and the modern Basque in matters of grammar and phonetics.

ADDITIONAL BILINGUALS.

The following bilinguals and larger texts I owe to the kindness of Mr. VanderSmissen, who has collected them out of Fabretti and other sources not at present accessible to me, for the purpose of subjecting the syllabary to every reasonable test.

The following is given by Lanzi (Vol. II., p. 565, No. 8) but in a very imperfect shape.

Fabretti 69, Pl. VI. F · ATIVS · L · F · STE · HARVSPE
FVLGVRIATOR
C · A8AYES LP · LP · HEYMFIS · YPVYNFY · 8PBNYAC

The point between the initial C and the following A is not part of the text. The E's and F's are archaic in form, but are, I think, correctly rendered as such by Lanzi. The M of the fourth group may be m. The V of the fifth group is indistinct in Fabretti, but Lanzi recognized it as such. The character I have given as B is of the same form above as 8, but the lower half is open. As a variant of 8 I represent it by the nearest, indeed by the only, variant contained in the syllabary I read the Etruscan :

chiral iraguneno astu astu ganekunoagiuno kutupikukaagiku latuul kakurachi
jar alargun no azti azti ganako no *egiun kutubiku* **ka** *egiku* **Altahola gogo eritsi**
attention widow of diviner diviner sacrifice of indicator lightning by indicator
Altahola memory to honour

I am not aware of any present Basque word for sacrifice. The term *gunako* now means towards, and used substantively may have denoted that which is offered to the gods. The forms *egiun*, *egiku*, are also as archaic as the mode of writing them. There are several words that agree in general meaning; *age*, appearance, indication, *egia*, truth, *iyerri*, to divine, the root *ag*, *eg*, *iy*, seeming to have the meaning of, manifest. The diverse terminations *uno* and *ku* or *ko*, I do not profess to explain.[108] As difficult is the word *kutubiku*. The present word for lightning is *chimista*, *chismista*, *chistmista*, for which I know of no etymology having been given. The Circassian forms are *chobske*, *kopk*. The Mizjejian uses a similar form, *kebche*, for thunder, and the Lesghian designates this accompaniment of lightning, *kutiburi* and *kokkubikuli*. Pursuing the search among the more distant Khitan. we find the Yeniseian Khitts calling "lightning" *yekene-bok*, *ykende-bok*, with which word Dr. Latham has compared the Yukahirian *bug-onshe*. The persistent b-k appears also in the Lesghian *lanzvikuli*, as *vik*. On the same page of the Sprach-Atlas accompanying Klaproth's Asia Polyglotta in which *bug-onshe* is found, appears *bug-ylbe*, meaning a beard. Beard in Basque is *bizar;* hence *biz* is the equivalent of *bug*. Now in Van Eys's dictionary under *bizi*, life, we meet with *biztu*, *pitztu*, to light, excite, resuscitate. Lecluse gives *piztea* as meaning "allumer, rallumer, ressusciter." The word *biztu* is *biz* with the verbal termination *tu*, and may or may not be related to *bizi*, life. This *biz* or *biztu*, by one of the commonest interchanges of labials has become *mista*, and the prefixed *chist* represents the old *kutu*. Had the origin of the word remained in the memory of the Basques, they would probably have retained the Etruscan term in the inverted form *bizkatu*, like *banakatu*, *kilikatu*, and many words of the same formation. The following *ka* is the postposition by. The name of the haruspex and fulguriator seems to be Altahola, Ilduhala, the relation of which to Atius or Fatius I leave to others to trace. His name is governed by *gogo*, memory, in the genitive of position. The final verb *eritsi* is in the infinitive to *jar* at the beginning of the inscription.

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[107] Fabretti modifies 347 :
LAPOA8VNE · SKOPESA
zaratu ma ralapi kane none matunenare
zarratu mai Ralapi kane non ema duen andre
written tablet Ralapi makes which give he does wife
The sense is far from clear. I may add that the final E of the first group is uncertain in Fabretti.

In the next bilingual, for the sake of uniformity, I have placed the Etruscan below the Latin, although the former is on the lid of the coffer and the latter on the side.

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[108] Elsewhere I have found FIS evidently a compound of *egin* and *on*, to do good or show benevolence Here it may be *age on*, to indicate good, or give good omens. In the second, *ageku*, the last syllable takes the place of *sa*, an Etruscan particle denoting agency.

Fabretti 1496. P · VOLVMNIVS · A · F · VIOLENS
Pl. xxxvi. CAFATIA · NATVS
ΛVΛFELImNA AV CA8AYIAL

In the last group the second A is indistinct. The name occurs in Lanzi 62, 63, 165 and elsewhere, so that A is well attested.

bapiba aginsaumikara arpi zeralarakuu rasa
Papiba Eginezaumak ra arpi Zerulurrekoi sortze
Papiba Eginezaumak, to behold Zerulurrekoi *natus*

The most important name in this group is Eginezaumak which translates Volumnius, the man of the book. Scriptor or Librarius would have done as well, but they did not represent Roman gentes. The first part of the word is *egin*, to do or make. The second, *ezaumak*, or in Etruscan *zaumika*, survives in Basque only as *esemesak*, opinion, saying; for *liburu*, the Latin word, has displaced the native name. The Etruscan word must have been derived, however, not from *esan*, to say, but from *ezaun*, *ezagun*, to know. The Japanese word for a book is *shomotsu*, and the Loochooan, *shimutsi*. This word is exceedingly old, for it appears in the ancient Accadian of Chaldea, a thoroughly Turanian language, as *samak*, *sumuk*. a library: Sayce's Assyrian Grammar, p. 16, Nos. 175, 176. The only other literary people of the Khitan, the Aztecs, preserved the word for book in an abbreviated form as *amox*. Thus Eginezaumika is the bookmaker, or author, or scribe. The preceding Bapiba is probably the original of the Latin Fabius, which denoted a gens eminent in literature and art, and persistently connected with Etruria: Dennis' Etruria, Vol. I., p. 425. Q. Fabius Pictor was the earliest Roman historian, as his grandfather had been the first artist. Two other Roman historians, Cincius and Sisenna, bore Etruscan names. Bapiba is the word translated Violens. The nearest equivalent in Basque is *buhumba*, by which the Greek *lailaps* and Latin *turbo* are translated in the Testament of Rochelle, Mark iv. 37. The Japanese furnishes the corresponding words *boju* and *fubuki*, and the Choctaw, *fapah*, *fopah*, the roaring of the wind. The Basque *pompoila*, a surging billow and *pampots*, palpitation, are probably of the same origin. The remaining proper name is that of Cafatia, in Etruscan zeru-lurre-koi. The first part is *zeru*, heaven, but also meaning (Lecluse, voûte) a ceiling or vaulted roof. The second part *lurre koi*, has occurred in the forms *lurrenokoi*, *lurrezkoi*, denoting an earthen receptacle. I am disposed to regard *koi* as the Etruscan equivalent of the Japanese *koya*, a small house, hut, or pen. I do not know what Basque word corresponds, as *khutcha*, box, chest, is said to come from the Spanish *hucha*, and in any case the increment calls for explanation. Still Zerulurrekoi, as "the domed earthen chamber," although a strange name for an Etruscan lady, answers to Cafatia, as Cavatia. The final AL should be NAL, *sortze*, natus, as other bilinguals indicate. That there was an intention to assimilate the Etruscan to the Latin in this inscription is plain, from the unusually prominent place given to the name Papiba.[109]

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[109] For other inscriptions bearing the same name, see note 64. The characters FEL, as constituting the word *aginza*, an offering, are of constant recurrence on Etruscan monuments. As in this case, *egin-ezaumeka*, FE represents the common verbs *egin* and *agin*. The tendency I have had to resist is one in the direction of translating all *agins* and *aginzas*, which can only be corrected by a careful comparison of inscriptions.

Mr. VanderSmissen calls my attention to the tomb of the gens Volturnia, near Perusia, which contains urns with the following inscriptions:

Fabretti 1480. LA · FELOVPNAM · FI,IIAL
sara aginsamapetukarano agubaurasa
zarra Aginzamaiepatugarri no gai bahi eritsa
writing Aginzamai-Epatugarri of good consort honours

The long name Aginzamai-Epatugarri, which has been read Velthurnas, is one like Eginezaumika of note 64, derived from the occupation or craft of the family. It means "the setter up of memorial tablets;" adding to the already familiar *aginza mai*, the compound of *epatu*, fix, set a limit, and *ekarri*, bring. The name of the consort is not given, unless I am in error in reading FI,II as *gai bahi*. In the Eugubine Tables FI frequently occurs for *gai*, fitting capable, suitable. The following *bahi* now means, a pledge, but many instances of its use serve to show that in Etruscan it also indicated one who is pledged or engaged to another. I do not know if the Japanese *fufu*, husband and wife, represents this word. In Choctaw *ibafohkah*, to unite, add to, probably exhibits the original meaning of the root.

1481. SE · FELOVPNA · AVLEM
none aginsamapitukara rapisaneno
non Aginzamai-Epatugarri erpetzen no
which Aginzamai-Epatugarri holding of

This inscription is elliptical if I read it correctly.

1482. LO · SEYPI · FELOVPNAM
asma nonekutuu aginsamapitukarano
asma non chedee Aginzamai-Epatugarri no
indication which sets the mark Aginzamai-Epatugarri of

The word YPI, *kutuu*, appears more than once in the Eugubine Tables (I. b. 16, &c.), denoting limit, boundary, which in Basque is *chede*, *gede*. In Japanese *kiwa* generally bears this signification and forms verbs of defining and limiting, but *kata*, a side, border, answers to *kiwa*.

1479. SE · FELOVPNA · SEYPE
none aginsamapitukara nonekutune
non Aginzamai-Epatugarri non ekiten

I cannot translate this as it stands with a double *non* and *kutune* instead of *kutuu*. In the Eugubine Tables, the extent and historical nature of which give abundant opportunity to discovering and confirming the values of words, *kutune* stands for the Basque *ekiten*, undertake.

Fabretti 794. OTACILIVS · RVFVS · VARIA · NATVS
AO · VNAYA · ΛAPNAL AP
erma bekari gori baratu karasa artu
arama (darama) Beharri Gorri *Baratu* sortze artu
it bears Beharri Gorri Baratu *natum* hold !

The verb *eraman*, to bear, makes *darama* in the 3 sing. pres. indic. In Etruscan this initial *d* is consistently dispensed with. In this inscription it is evident that the Etruscan characters do not coincide with the Latin. This is no case of correspondence like Caulias, Sentis, Licini and Volumnius. The artist has been honest as well as ingenious. Wishing to translate the name Bekari, now *beharri*, *belarri*, an ear, the original form of which probably survives in *pikero*, the ass, (long ears), by a recognized Latin proper name, he took that of the Otacilian gens in which, rightly or wrongly, he recognized the Greek *otikos*. The following *gorri*, red, he translated Rufus. The name read Varia is harder to explain as an equivalent of Baratu. The present Basque word *nabar*, bigarré, answering in a measure to the Japanese *mabure*, would perfectly reproduce Varia. In my paper on the Aztec and its Relations I have shown how, in Aztec, *palli* denotes both colour and contents, like the Japanese *iro* and *iru*, which in composition become *biro* and *biru* ; and have suggested a similar relation between the Basque *bar*, within, and a primitive *bal* or *bar*, the root of *beltz*, *baltz*, black, meaning colour. The Japanese for Varia is *iro-dori*. As the equivalent of this I suppose an ancient Basque or Etruscan *baratu*, of which *baitu*, spotted, may be the representative.

Fabretti 793. C · VENSIVS · C · F · CAIVS
FEL · FEN‡ILE · AL8NALISLE
aginza egin kaitch u sane rasalakarasaunosune
aginza egin Kaitch Usena Rusellae sortze onetzen
offering makes Kaitch, Usena *Rusellis natum* to esteem

In this case Kaitch or Kaich is Caius, and Vensius is the Latin translation of Usena. The latter word now means "a leech." Of

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Mr. VanderSmissen also points out the frequent recurrence of the gentile names Vibia Vercinia as:

1453, &c. FIΛI · FEPCNAM

These characters read: agubau aginduchikarano

The first may be *gai bahi*, see 1480, or it may be a name. The second word contains *agindu*, the verb, to command or promise. It is premature to pronounce on the meaning of *chikara*, *estari*. The final *no* is probably the genitive.

its derivation as well as of that of Vensius I am ignorant. Should Vensius derive from the Greek *phoinisso*, or from the Latin *vena*, the words may coincide as the two significations of "leech" in English. The native of Rusellae may have been a primitive physician or phlebotomist.

Fabretti 792. C · ALFIVS · A · F
CAINNIA NATVS
FL · ALSm · NVFI
CAINAL
egi so rasalami kabe egiu
zerua karasa
egi so Rusellae imi Kofa egio   Look Rusellae places Kabegio
Zerua sortze   Zerua *natum*

This is another native of Rusellae. The final m or *imi* is very unusual. Kabegio is plainly meant for Alfius, and Zerua for Cainnia. Now Zerua is a form of *zeru*, the sky, so that Cainnia must stand for Cyanea. Also Alfius, if it mean anything, is Alveus, and to this *kofa*, hollow, corresponds. Van Eys derives *kofa*, *koba*, *kavi*, *gabia*, &c., from the Spanish and Provençal, but the Japanese *kuboi*, concave, hollowed, and *kubomi*, a concavity, a hollow place, restore them to their rank as native words. The Choctaw also has *kafakbi* a dent, hollow, and *kafakbichih*, to make hollow. Such a form as the latter must Kabegio be, the latter part of the word being the verb *egin*, to make.

Fabretti 934. SPEDII · TVLLIO
LAVYNAYA SEPYVPVS
sarapi kuka raḳura   nonetukupitupino
Zarrapo egoki irakurri   non Idoki *pitu* banu
Zarrabe belongs the reading ; where Doku lower I did

Spedius is not a Latin word, and must represent the Greek *spadón*, a tear, or a rough sharp sound, which is not indeed the meaning of *zarrapo*, but of the related *zarrasta*, "bruit que fait la toile quand on la déchire." The other name, Tullius, translates Idoki, which means "to take away," by *tollo* rather than by *tuli*. The verb *pitu* or *betu* is unknown to modern Basque. The commonest use of V, *be* is as the postposition "under" It may be that *betu* is an old form answering to *beheititu*, *beheratu*, to lower.[109a] It is followed by *pino* or *benu*, the Etruscan equivalent of *nuen*, I did. The lineal descendant of *benu*, namely *banu*, has now subjunctive force, if I did. YN is *eyoki*. But it is hard to say what is its grammatical value. As "it concerns me" the form in Basque would be *dagokit;* as "it concerns him" *dagokio*. The latter in Etruscan is YNI *gokao*, as has already appeared.

[109a] It is more likely that *pitu*, *betu* is the original of the Basque *epatu*, to fix, set a limit or mark. See Tomb of Sarapikuka, line 1.

Fabretti 936. A · TITIVS · A · F · SCAE · CALIS
A · TITI · A · FANIAL
ra kuukuu ra agerkaurasa
ara Koikoi ara ezkerka au eritza
behold Koikoi, behold Agerka this esteems

Titius is the name of a Roman gens, but it is hard to say what its meaning is. If borrowed from the Carthaginians, it and Titus would, like Dido, mean "beloved;" and as such, Titius would fitly translate Koikoi, a superlative of repetition, "the greatly desired." The name Agerka represents the Latin ScaeCalis, which itself needs translation. The present Basque word for left is *ezker*, supposed to come from *esku-oker*, *esku* being hand, and *oker* oblique, tortuous, awry. Agerka, however, is neither *ezker* nor *oker*. It is probable that the present *ezker* has been conformed to the Spanish *esquerro*. Still, the Lesghian forms *kisil* and *kuzal*, indicate that the original Basque word resembled the Spanish. It is unfortunate that no text contains the Etruscan word for hand, which I hardly expect to find as *esku*, the Basque term. The Lesghian *kua*, *kak*, *ker*, *kuer*, *kulg*, Circassian *oyg*, Mizjejian *kuki*, *kuik*, and Georgian *ke*, *che*, *cheli*, favour *ku* or *ker*. The Basque *ahur*, hollow of the hand, accords with *ker*, *kuer*, &c. It cannot at present, therefore, be decided that Agerka is, or is not, the Etruscan for "left-handed." Such a name is not uncommon among the Khitan. The Abbé Cuoq, Lexique de la langue iroquoise, p. 42, cites "Skanekwati, nom de femme, la gauchère, Shanekwati, nom d'homme, le gaucher."[110]

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[110] Among the bilinguals may almost be reckoned a Latin and an Etruscan inscription on distinct ossuaria, which however were found in close proximity.

Fabretti 714. L · SCAEVIVS · L · F · ARN · · · · · AEVNVS
LO · SCEFA · MAYNAL
asma nochineager norakukarasa

The construction is somewhat peculiar, yet I think the *ager* of *nochineager* corresponds to the *ager* of *agerka au eritza* in 936, especially as the Scaevius of the twin ossuarium answers to the Scae of the other inscription. The peculiar construction of 714 is due to the attempt of the engraver to present an apparent accord between the Latin and the Etruscan. He has

Fabretti 1888. L · F · TIITIA · GNATA
MIISIA · ARVN
AP · mESI ·

The last line is written in the original from right to left, and thus it is supposed to be the only Etruscan part of the inscription. But the Etruscans and all the Khitan wrote frequently from left to right, and boustrophedon, as in this case. MIISIA · ARVN is not like part of a Latin inscription. I read it as Etruscan.

nota no ura artupika
artu mine nou
Nata no aur *Artupika*
artu min nau
Nata of child Artupika
receive grief she me does (she receives my grief)

Nata is the *Gnata* of the Latin, which is here a proper name, and not the participle of *nascor*. Artupika represents Tiitia. This peculiar name can only connect with Taeda, pitch-pine, a pitch-pine torch. In bilingual, Fabretti 69, *piku* has appeared as the Etruscan form of *biz* in *biztu*, to light. Here, however, we have not *piku* but *pika*, doubtless a different word. The first part of the word is probably *arte*, a tree, rather than *ardai*, tinder. The second part, *pika*, some Basque scholar may be able to explain.

Fabretti 980. Q · SENTIVS · L · F · ARRIA · NATVS
CVINYF · MφNV · APNYNAL
chipi u ka kuagi no ma gabe artu kaku karasa
Sipi uga Kuagi une mai gabe artu gogo sortze
Sipi's mother Kuagi this table without holds memory child

Here I have taken a license in making M, which in the original has an imperfect second limb, thus giving prominence to the first, the equivalent of *une*. I am not sure that the bisected O is *mai*. It may be *ma*, which elsewhere, following *zarratu*, is unmistakably the same as *mai*. The word Sentius I take to have the same meaning as Sentia in Lanzi's bilingual 2, that is, thorn-bush, brier, bramble. It is here translated by Chipi or Sepe, not a modern word. The Basque *zapar*, *sapar*, means bush, brier, bramble, and is

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violated grammatical construction by placing the verb *nechina* or *aintzin* before Ager for this end. I read

asma aintzin Ager Noraku sortze
indication to present Ager Noraku *natus*

In this way *Ager* is the original of the Basque *ezker*, left.

the same as the Japanese *shiba*, brushwood, and the Choctaw *shauwa*, brush, bushes. Perhaps *chibe* or *shibe* was the Etruscan form, being a variant of *chipi*, little, to denote undergrowth. Were the meaning of the Latin Arria clear, some connection might be found for Kuagi, or better, Goegi. If it be an expedient for *arrigo*, then *go egi* will be an allowable form of *goititu*, élever, and a sufficient translation of the mother's name.

Fabretti 794. L · PHISIVS · L · LAVCI
LEVCLE · φISIS · LAFYNI

From Fabretti's various readings I have only adopted Y in the last group instead of a doubtful T.

su ne pi chi sunc mai unouno sari egi kukau
zuen Pisisu ne mai on oan Sari-egi egokio
ye who Pisisu to tablet ? Sari-egi belongs.

This inscription has been intentionally obscured in meaning, for the purpose of putting an apparent Phisis into the Etruscan text. If this be not the case, how is it that all the bilinguals do not yield to the same key ? In the same way *zuen* is placed before the true Pisisu, to make it look like Levcle, reproducing Lauci. This Lauci is a barbarous disguise of *laus*, for Sari-egi, from *sari* and *egin*, means praise, or praising. The unusual verbal form *onoono*, or *onoan*, is similar to that of *joan*, to go, *jan*, to eat. It is probably a compound of *on*, good, and an old verb, *oan*, to pay attention or regard, answering to the Japanese *uyamai*, which is now represented in Basque by *o-artu*. The inscription will thus read : "Ye who kindly regard the tablet to Pisius, to Sari-egi it belongs."

Fabretti 460. C · CASSIVS · C · F · SATVRNINVS
F · CFS‡ I · C · CLAIY
age chiagnoitchu chi chisarauku
age Chiagnoichio age Isats arauki
behold Chiaganichio, behold Isats conformable

This text is far from clear. The C which stands alone in the third place should, I think, be F *agi*, for *che*, even, is always an affix. The final IY in my copy are so close to one another as to suggest that they represent an original N. In this case *raka*, now *rako*, towards, would take the place of the uncommon *arauki*, conformable. The most important word is CL, which I read *isats*, but which originally must have been *chisa*, inasmuch as it is the Etruscan *cassis*, which Isidore says means a helmet. The analogy of *cassita*, the crested or tufted lark, would give "plume" rather than helmet as the meaning, the helmet being merely the plume-bearer. In Basque *egatz* is a feather; *egazti*, plumed, covered with feathers. But there is another form *isats*, which now denotes, equally with *egatz*, a fin, and is also applied to a small feather brush without a handle. These two forms, *egatz*, the guttural, and *isats*, the sibilant, point to an original *chatz* or *chas*, whence the Latin *cassis*, a plume or plumed helmet. The Circassian *kutz*, a feather, retains a better form of the word than the Basque. The Choctaw has *hishi* and *hoshishi*, but the Japanese applies the corresponding *gushi* exclusively to the hair. In many Khitan languages, as in the Choctaw, the same word denotes hair, feathers, and leaves.

Saturninus is a case of "first catch your hare." What word does it intend to set forth, *sator*, *satur*, *satura*, *Saturnus*, *Saturni sacra dies*? I find the initial *chiag* or *izag* in the augurial templum of Piacenza forming *chiag-sarasaba* and *kusapino-chiag*. As the templum is astronomical in character, Chiag-Noitchio may denote the planet Saturn. There is room here for wide conjecture, and a foundation perhaps for a system of Etruscan mythology. The word Noitchio may equally be read Anichio. Unhappily, little or no mythology has been preserved by the Basques.

The last of the bilinguals is one not generally regarded as such, the whole having been read as Etruscan. The first line, however, is Latin, the two names being feminine, and the last probably in the ablative case.

Fabretti 949. ARIA · BASSA
ARNTHAL · FRAVNAL
artu kaku karasu　egiaterbe karasa
artu gogo Karasu　Egi-Aterbe sortze
to keep memory Karasu　Egi-Aterbe *nata*

The Latin names are still puzzling. The scribe evidently translated the Etruscan into Latin or Greek in his own mind, and then cast about him for a Latin name having some likeness to the translation. If Aria stand for Aëria, the only modern Basque word answering to it and approaching *karasu* is *egurastu*, aérer, exposer au jour. It is a compound of *egun*, day, which in Lesghian is *kini*. I very much doubt that *karasu* is *eguraz*. It is strange that the Japanese equivalent of *egurastu* should be *sarasu*. The name I give provisionally to Karasu's mother is Egi-Aterbe, which means "making shelter." Van Eys defines *atherbe*, *atharbe* as "lieu pour être à l'abri de la pluie ; par extension, maison, toit." It is derived from *athari*, the Basque equivalent for the Latinized Etruscan *atrium*. The Greek *pastas*, a kind of porch, may be the translation out of which the scribe evolved Bassa. A difficulty in the way of the reading given is that R is rendered in one case *tu*, and in the other *at*, which is an inconsistency very unlikely to take place. Could we find the Etruscan word given by the Romans as *atrium*, it would decide the value of one of the *t* syllables. This and similar arrivals at the exactitude desired will require time and coöperation, just as they were required in the case of Egyptian, Assyrian, and other decipherments.

LARGER TEXTS.

In Fabretti, Table XXXVIII. No. 1914, appears the Cippus of Perusia. The front and left side of this monument are covered with Etruscan characters. As those on the left side furnish the key to the narrative, and are uninjured, I present them first. As the lines are very short I give them in groups of four.

Left Side of Cippus.

1-4. FELOINAM · AYENA‡VCIENEƧCI · I/ʌAM/ʌELANE[111]
aginsa maukarano rakunekara ichpichiu nekanenochiu ubaranobanesarakane
aginza mai ekarri no aragune *kara* ichpichio nekian *nochiu* obi rano banaiz eragin
offering tablet bringing of accordant states contribution I did request grave towards I am causing to make

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[111] Cippus of Perusia, Left side:

Lines 1-4. *aginsa*, Van Eys *agintza*, offering: in genitive of position to *mai*. *mai*, table, here used, like the Japanese *mei*, to denote tablet, inscription. *ekarri*, to bring, in Etruscan probably *kara*; the participial form governed in the genitive by the postposition *no*.

no or *na*, the Etruscan postposition of. In modern Basque *no* or *na* is reduced to *n* or *en*, The Japanese genitive particles *na* and *ga* answer to the Etruscan *no* and *go*, the Basque *en* and *go*, and the Iroquois *ne* and *ke*, which are also locative. The Choctaw genitive *in* belongs to the same series.

ara gune kara. For *kara* see *kakara*, Front of Cippus, lines 1 and 5. The meaning of *kakara*, of which *kara* is an abbreviation, is plainly a state. It is not modern Basque, but may answer to the Japanese *kori*, a division of a country, or province. It is possible that the Basque *herri*, *erri*, a country, is a descendant of *kara*. The preceding *gune* is literally a place, but forms compounds like *on-gune*, bon accord. Here it is preceded by *ara*, more fully *arau*, right. In modern Basque *arau* makes *ar-alde*, *ar-aldetu*. So here, *ar-gune*, accordant or conformable, indicating the states which conformed to the terms of the Tuscan confederacy.

ichpichio: the commoner word is *ichpi*, which in Basque means "petit morceau d'un corps dur,' and is a synonym of *pikor*. The Basque *irhpicho*, derived from *ichpi*, means "pari,

5-8. OI · 8VLVm⅃ FAM/ᐱELOIPENEOIEMY ACFELOINA[112]
mau albeaspi mi go ager no banesa mautune kanemaunenoku rachi aginsa mau kara
mai albo azpi imi go agerrian banaiz ema autune kian mai ne naga eritsi aginza mai ekarri
tablet side under placing of information I am giving choose who did tablet to hate estimation offering tablet bring

9-12. ACILVNE ϒVPVNEMC VNE‡EA‡VCI · ENESCI · AO[113]
rachiusapikane kupitupikanenochi pikaneichenra ichpichio nekanenochiu rama
eritsi utsa bakine jabe tobe kian aintzi bakine etsain ra ichpichio nekian nochiu Roma
to esteem fails to communicate lords instead he did warn to communicate oppose to contribution I did request Rome

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gageure," but in Etruscan *ichpi* and *ichpichio* evidently denote a contribution. The Japanese *tsubu*, a grain or morsel, is the equivalent of *ichpi*.

ne kian nochiu: I do not recognize *nochiu* in Basque, although its meaning "desire" is contained in the verb *nai*. It answers to the Japanese *nozo-mu*, desire, wish for. The Japanese verb corresponding to *nai*, *nahi* is *negau*. In Basque the auxiliary *kian* follows the verb as in *n-eraus kian*, the 1st sing. imp. ind. of *erausi*. Here it is attached to the pronoun.

obi rano, in Etruscan *oba rano*. The word *obi*, *hobi* means a grave, and forms *obi-ratu*, bury. The Choctaw has the simpler form *hoppih*, bury. The postposition *rano*, towards, also occurs as *ra*, *rako*, *rakano*, *ranoku*. In Japanese it survives in an old form *ga-ri*, towards.

banaiz eragin: *banaiz* is now a modified 1st sing. pres. ind. of *naiz*, meaning "if I am." As I have already stated, the Etruscan employs these forms constantly in a categorical sense. The verb *eragin* is the present Basque equivalent of ANE, but see what I have said of the two Etruscan verbs FE, *egin*, and NE, kane: note 49*a*.

[112] Lines 5-8. *mai*, the regimen of *eragin*.

albo azpi imi go: the Basque *albo* was *albe* in Etruscan, and is the Choctaw *alapa*, side. The postposition *azpi*, often *be* or *pi*, means under, but here must rather signify on. The verb *imi*, probably *mi* in Etruscan, is in Basque *imini* or *ipini*. It probably survives in the final *mi* and *mu* of Japanese derivative verbs, as in *tsuka-mu*, to grasp, from *tsuka*, a handle, *ina mu*, to refuse, from *ina*, no. These will thus mean "to place a handle, to place a no," which are thoroughly Etruscan idioms. The Choctaw *maia*, *maiachih*, to put in, is a form of *mi* or *imi*. Here the verb is participial, governed by *go*, the postposition "of."

agerrian banaiz: the first word means "à découvert"; for *banaiz*, see end of line 1-4.

ema autu ne kian: *ema*, now *eman*, give, makes *emaiten* in the infinitive, and *emak*, *bema* in the imperative. Here it is used as an infinitive. It is the Choctaw *imah*. The verb *autu*, now *auta*, *autetsi*, *hautatu*, is separated from its auxiliary *kian* by the relative *ne*, which modern Basque preserves as final *n* or *en*.

mai ne naga; *mai* is in the dative "to *ne*," the postposition to, in. The following *naga* is the Etruscan original of the Basque *nagatu*, detest. Van Eys says: "Ce nom. verb. doit dériver de *naga* ou *nazka*, que ne se trouvent pas." It is the Japanese *niku-mu* and the Choctaw *nukkillih*. Here *naga*, or in Etruscan *nago*, is in the infinitive to *auta*, or may form a compound verb with the following *eritsi*, like *oneritsi*, to esteem, *gaitzeritsi*, hate.

eritsi aginza mai ekarri: *eritsi* is here infinitive in form.

[113] Lines 9-12. *eritsi utsa baki ne*: the two Basque words *utsi*, to leave, and *uts*, empty, appear to have had a common origin. The Japanese *ochi*, *ochiru*, to fall, fail, leave, decline, is evidently the same word. Here the meaning of *utsa* is "he fails," which in Basque would be *utsegin da*. In Etruscan apparently *utsi*, to fail, dispensed with the auxiliary, and in the 3 sing. pres. ind. became *utsa*. The preceding *eritsi* is in the infinitive to *utsa*. The following

13-16. VmICM · A8VNAM · ⁄ENONA · AmAFELOINA · A8VN[114]
bemiuchino ralapikarano banekamakara ramira aginsa maukara ralapika
beimi oyeche no Ralapika rano bane gomu ekarri eramira aginza mai ekarri Ralapika
subject these of Ralapika towards united memory bring causing to see offering tablet bringing Ralapika

17-20. OVPVNI · EIN‡EPIVNAC⅃A . OI⅃OVN⅃ V⅃OL · I⅃ · CA[115]
mabetubekau neuka ichentuube kara chigora mauasmabekago pisamasa ugo chira
ambat begai nayago etsainta obe ekarri zigor mai asma begogo Pisa emaitza uko ezarri
great regard I desire inimical chief to bear scourge tablet meaning regarding Pisa gift refusal throws

---

beka ne or *baki-ne* I read as a form of the Basque *baki-datu*, communicate, the final *ne* being the postposition "to." The sense would be clearer could VNE be read VYE, *bekune*, which is the Etruscan for only, alone: "one only fails to honour."

jabe tobe kian aintzi; jabe, Etruscan *kobe*, is here used as a plural without sign, as in Japanese. It is governed by *tobe*, a purely Etruscan word, answering to the Basque *bidean*, in place of. It may be a compound of *toki*, place, and *be*, under. In Choctaw *ulh-tobah* means in place of. The auxiliary *kian* precedes the verb *aintzi*, now *ainzindu*, *aitzindu*, devancer, prévenir.

bakine etsain ra ichpichio: here *bekane* or *baki-ne* means to communicate. The following word, ‡E, should, according to Front of Cippus, line 16, be ‡M, unless it be a different word of like signification. It means to oppose, and the following *ra* euphoniously takes the place of *ne*, to.

nekian nochiu: for *nochiu* see line 1. The relative *ne* is probably omitted to avoid the repetition of the same sound. Therefore *nekian* may be translated "which I did."

Roma, now *Erroma:* the Basque form exhibits the peculiarity of that language as compared with sister tongues, which I have illustrated in my papers as the Khitan languages, namely, the prefixion of vowels to many words whose original initial letter was a consonant. There is no evidence that the Etruscans did the same. The Cippus evidently belongs to a period when Etruria, although maintaining its ancient constitution, was in recognized subjection to Rome.

[114] Lines 13-16. *bemi oyeche no:* the present Basque words for subject are *mendeko, botoya.* This *bemi* is a compound of *be*, under, and *imi*, to place, meaning the same as *subjectus.* In Basque *oyechek* is "even these," and *oyechen* "of even these." The Etruscan genitive is marked by the stronger *no.*

Ralapika rano, towards Ralapika. This is the name of the Lucumo, probably a native of Perusia, in whose honour the Cippus was erected. Etruscan proper names, like the Basque and American Khitan, seem to be significant. I leave the determination of their meaning to Basque scholars. The name may read Aralbeka.

bane gomu ekarri; bane is the abbreviated form of *banetu*, answering to the Basque *batu.* The Etruscan *gamu* represents the *gomu* of the Basque *gomuta*, remembrance. Compare Etruscan *gago* and Basque *gogo.* The verb *ekarri* is used participially.

eramira aginza mai ekarri: the only word to note is *eramira*, which is not modern Basque. It is, however, regularly formed by prefixing the causative *era*, as in *eraman, erakarri*, to the verb *mira, miratu. Ralapika* is in the genitive of position to *ambat begai.*

[115] Lines 17-20. *ambat begai:* Basque lexicographers suppose *ain* to be the root of *ambat.* It is more probable that *ain* is a corruption of an original *am*, for the Basque is hardly tolerant of the letter *m*, save at the beginning of a word. In Japanese *omoi*, meaning weighty, important, great, seems to present the same root. As *ambe*, the Etruscan uses the word to represent

21. CELA‡ILVLE[116]
chinegora ich ugo begone
chingar etsaigo beko ne
spark enmity of prince to

Front of Cippus.

1. EVLNY · YA · NNA · LAPE‡LV[117]
nepisakaku kura kakara saratu ne ichsa be
ni Pisa gogo gure kakara zarratu ne itsas be
I Pisa's mind desiring states writing to adhesion under

---

the adjective great. Here, as in Basque, *ambat* seems to mean "so much, how much." The following *begai* is Etruscan, not Basque, which has the verbs *begiratu* and *begistatu*, meaning to regard. It is evidently a noun, signifying regard, esteem.

nayago etsain a obe ekarri zigor: *nayago* is a comparative of *nai*, meaning "rather desire," or "prefer"; the pronoun *ne* is omitted, perhaps because the word in Etruscan begins with *ne*. The verbal adjective *etsainta* I do not know in Basque, but *etsain-tasun* is the noun "enmity." It is spelt in this place as in lines 9–12, ‡E. The noun *obe* means literally "better," and in its use answers to the Greek *aristeus* and Latin *optimas*. In the Eugubine Tables it frequently replaces *jabe*. The verb *ekarri* is in the infinitive to *nayago*, which also governs *obe*. The last word, *zigor*, was probably *zigora* in Etruscan.

mai asma begogo: *asma*, signification, governs *mai* in the genitive by position. This genitive of position is not uncommon in Japanese, and is the usual form in Choctaw and many other Khitan languages. The verb *begogo*, Etruscan *begago*, is not Basque. It seems to be a compound of *gogo*, the mind, rather than of *begi*, the eye, and to mean considering. It answers in signification to the Basque *behatu*, the *be* of which is doubtless the *be* of *begogo*.

Pisa emaitza, in Etruscan *emats*: Pisa is governed in the genitive by *emaitza*, which is governed in the same way by the following, *uko*, refusal, denial.

ezarri; thus I read CA, which characters often stand for *zeru*, heaven, and for an Etruscan word, the nearest to which in signification is the Basque *jarri*. Here the sense calls for a verb meaning to place or throw, both of which significations are included in *ezarri*. It is here conjugated without regular auxiliary, and following the analogy of *ekarri*, should be *ezar*.

[116] Line 21. *chingar etsai go beko ne*: *chingar*, in Etruscan perhaps *chinegora*, means, a spark. The initial *chi* may represent *su*, fire, which appears in the Lesghian dialects as *zi*, *za*, *zo*. The Japanese word for fire is *hi*, and *hinoko* is a spark. But the same language preserves *su* as a word for fire in *subitsu*, the hearth, *sumi*, charcoal. The noun *etsai* now means an enemy, and *etsaigo*, enmity. There is no doubt, however, that the word should be read *etsai go*, of enmity, because its regimen *chingar* precedes it, and thus demands the postposition.

The word *beko* followed by the postposition *ne*, to or in, is not Basque. It appears in a Celtiberian inscription in the form *Roma beka*, replacing *Roma jabe*. It must, therefore, be an Etruscan and ancient Basque word for prince, connecting with the present *bekoki*, which Van Eys renders "front, audace." It is the same word as the Japanese and Choctaw *miko*, a prince, chief or governor. Immediately above it in the Choctaw dictionary appears *mika* or *bika*, both answering to the Basque *biga* or *miga*, two.

[117] Cippus of Perusia. Front, line 1. This line is defaced in the part of the first group which I have restored as LN, and in the end of the last group where I read LV.

ni Pisa gogo gure. The *ni*, I, is at once the subject of the participial *gure* and the verb *agerrikatu* in the second line. *Pisa* is in the genitive of position to *gogo*. The word *gure* is used as a participle, desiring, and governs *erimini* in the next line in the infinitive.

kakara, the states, without sign of plurality, has been referred to in lines 1-4, left side. It is in the genitive of position to *zarratu*.

zarratu ne itsas be: *zarratu* is employed as a noun in the dative to *ne*. In Basque *itsaskor*, from *ich*, means adhering. In this place *itsas* is used as a noun and is governed by *be*, under, the whole signifying "under adhesion."

2. AMEFALDLAVYN · FELOINAM · E[118]
eramine ager gotu sarabe kuka aginsa maukarano ne
erimini agerri katu zarrapo egoki aginza mai ekarri no ni-
cause to place declare writing suitable offering tablet bringing of I

3. MYLAA8VNAMSLELELEOCAPV[119]
nokusararalapikaranonosanesanesanemachiratupi
-on ikusi ra Ralapika rano nas antsa antsa ne ema jar tobe
him did see cause Ralapika towards together caring care to giving attention instead of

4. YE‡AN8VMLEPIYESNMYEIM[120]
kuneichrakalabenosanetuukunenokanokuneuno
gune itcherik albo nas nituo gune noku naga ne on
us to adhering side together 1 to them do us to failing hates who good

---

[118] Line 2. *erimini agerrikatu zarrapo egoki.* The verb *erimini* is not Basque, but it is regularly compounded of the causative *era* and *imini*. It is in the infinitive to *gure*. The following *agerrikatu* should perhaps be *igorri-katu*, send, which will remove the syntactical difficulty of leaving *zarrapo egoki* without a governing word. Neither *agerri-katu* nor *igorri-katu* are Basque words, but *katu* is a common termination of Basque verbs, as in *igeri-katu*, to swim. Etruscan *zarabe*, Basque *zarrapo*, scratching, writing, is used as a synonym of *zarratu*. The Choctaw verbs to scratch are *shuluffih, kaluffih*. YN is always the Etruscan form for *egoki*.

aginza mai ekarri no, has appeared so frequently as to need no further explanation. The final *ni* belongs to the next line.

[119] Line 3. *nion ikusi ra ; nion* is good Basque, "I it to him did." The following *ikusi ra* is an inversion of *erakusi*, cause to see, instruct. I know of no corresponding Basque form of *ikusi*, but *ikasi*, to learn, becomes causative not only as *erakasi*, bnt also as *ikasarazi*.

Ralapika rano, needs no further explanation.

nas antza antza ne ; nas, Etruscan *nosa*, *nasa*, is still employed in one Basque dialect to mean together. It is evidently a compound word, as the Japanese represents it by *issho-ni*. The following *antza* repeated superlatively I cannot explain. The usual form of *antsi* to care for is EC, and here the word is plainly in the infinitive to *ne*.

ema jar tobe : here *jar* and *eman* come together as in the Basque word *jaramon*, faire cas de, faire attention. It seems to be used participially as "giving attention." The adverbial postposition *tobe*, instead of, has been considered.

[120] Line 4. *gune itcherik* : *gu* was the Etruscan pronoun, we, as it is the Basque, but in the dative it takes *ne* instead of *ri*. In some of the sepulchral inscriptions appears the long form *itchekirik*, from *itcheki*, to hold to, adhere. The final *rik*, of which *r* is for euphony, forms partitives and ablative absolutes. Here it seems to form a verbal adjective, adhering.

albo nas nituo ; *albonas* is in this place used as a compound verb with the auxiliary. The Etruscan had a pronominal form of *dut* in *nio*, answering to the Basque *diot*, as well as one in *nau* agreeing with the Basque *nau*. This *nio*, I to him do, is here in the plural of the regimen, *nituo*, I to them do, which answers to *nio* as *naute* does to *nau*.

gune noku naga ne ; *gune* is the pronoun "we" in the dative. The following *noku* has for its subject the *ne*, who, following *naga*. It survives in Basque as the noun *noku*, defect, and seems the same as the Japanese *nai*, *naku*, which with the auxiliary *naru*, means, to fail. In Etruscan it was *noka* and took rank as a verb. Here it should be in the 3 sing. pres. ind. without auxiliary. Its neighbour *naga*, in Etruscan *noku*, means, as has already appeared, to hate or oppose. It also is in the 3 sing. pres. ind. without auxiliary. The final *on*, in Etruscan *ono*, the adjective "good" belongs to the next line.

5. **PAMNEMIΛAAmABENNAΛEp**[121]
turano kaneno ubararamira ulne kakara banetu
Turano ganaino obi ra eramira Alin kakara banetu
Tyrrhenia towards grave to cause to see Dominion states united

6. **XII · FELOINAOVPAMAPAMΛE**[122]
xii aginsa mau karamapi turano ratura no bane
12 aginza mai ekarri ambe Turano ardura no bane-
12 offering tablet to bring great Tyrrhenia care of uni-

7. **DAMCEmVLmLESCVL‡VCIEN**[123]
turano chine mipisa misane nochipisa ichpi chi oneka
-tu ra aintzin imi Pisa imi ezan nauche Pisa ichpichio ne ki
-on to warning places Pisa place refuse he myself does Pisa contribution I

---

[121] Line 5. *Turano ganaino*: the Greco-Latin form Tyrrheni, and the Umbrian form Tarsin-ater indicate that the Etruscan word was Turaan rather than Turano. It is very probable that the word is the same as that Turan which has given a designation to the greater part of the human race, the Turanians. In his history of the reign of Feridun, Mirkhond, the Persian historian, sets forth Turan as embracing Chin, Machin and all the lands of Turkestan, that is, the countries north and north-east of Persia. Sadik Isfahani, in a geographical treatise, says that Turan extends from the Oxus to the extremity of the east, and northwards to the regions of darkness. The name Turan did not designate any one people, but was applied generically to many allied tribes or nations. The same word is probably found in *druna*, a gloss of Hesychius, who makes it equivalent to the Greek *arche*. Mr. John Fraser, in his "An Etrusci Celtae?" appropriately compares this word with the Tyrrhenian name and with the Greek *turannos*. The latter word has been derived from *koiranos*, but it is very probable that the Greeks picked it up in Asia Minor from the Hittite aborigines. The derivation of *druna* I have already suggested as being from the Basque *iturri*, source, fountain head. The Etruscans were the western Turan. The compound postposition *ganaino*, in Etruscan *ganeno* or *ganean*, now means as far as, but in Etruscan seems to have meant simply towards.

obi ra eramira : obi has appeared already (Left Side. 1-4), and *ra* needs no explanation. For *eramira* see Left Side, 13-16.

Alin kakara banetu XII., the 12 united states of the Dominion. The modern word for power, dominion, is *almen*, and this I have found in a Celtiberian inscription. In Etruria *alin* takes its place. Then follow the lost *kakara*, state or states, and *banetu*, united, the equivalent of the Basque *batu*. These 12 united states constituted *ono Turaan*, good Tyrrhenia.

[122] Line 6. *ambe Turano ardura no : ambe* means great in Etruscan. See note on *ambat*, Left Side, 17-20. Turano is governed in the genitive of position by *ardura*, a Basque word meaning care, which is itself governed by the postposition *no*, of.
bane belongs to the following line.

[123] Line 7. *banetu ra aintzin imi Pisa : banetu* is employed in this place as a noun, the union, and is governed by *ra*, to, towards. Also *aintzin* is a noun which means warning. But its composition with *imi* is precisely that of the Japanese to which I have referred in notes on Left Side, 5-8. Pisa was not one of the twelve states: Pignotti, Storia di Toscana, T. 1, p. 12.

ezan nauche Pisa ; ezan, now *ez*, *eza*, is here a verb conjugated with *dut*. The compound auxiliary *nau* is the Basque "he me does." The final *che*, self, qualifies the *ni*, and serves to denote the double action of Pisa: "it warns the union and refuses myself"

ichpichio nekian nochiu. See Left Side, 9-12.

8. ESCIE𐌋LYVLAPV[124]
nenochiu neb asakupisaratube
-an nochiu nabusi jabe sari tobe
did request master lord rewarding instead of

9. AVLEMI · FELOINAMAP‡NALCL[125]
rapisanenou aginsamai karano artu ichkarasachisa
arrapatzen nau aginza mai ekarri no artu itchekiri so chitsu
accuse me he does offering table bringing of to receive adherents regard precedence.

10. ENMI · OII · OILMCVNA · CENV · E[126]
nekanou mata mausanochipikara chinekabe ne
neke nau emat mai asantsipikor zein gabe na-
fail he me does to give tablet to erect contribution which without

11. 𐌋LC · SELICLAPOALMASVNEM[127]
basachi lanesauchisaratumarasanoralapikaneno
-busitze lanesa hitzzarratu mara asan Ralapika nen
command workman word to write monument erected Ralapika to

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[124] Line 8. *nabusi jabe sari tobe: nabusi*, in Etruscan *nebusa*, is an old Khitan word for master. It occurs in the long Phrygian inscription in Texier's "Asie Mineure," T. II., p. 157, the first group in which is not Kelokes, as it has been read, but *utzi nabusi utzi nion*, "lost master, I have lost him." It appears also in the Hittite inscriptions, Hamath I., II., IV. in the group I incorrectly read *ta basanesa sara*, which should be *nabusinesa zari*. Another Basque form of *nabusi* is *nausi*, answering to the Japanese *nushi*, master. The conjunction "and" is omitted between *nabusi* and *jabe*, which present the Japanese order. The word *sari* is employed as a participle, meaning "honouring" rather than "rewarding." It now means reward, and *saristatu* is to reward. The adverbial postposition *tobe*, instead of, governs *sari*.

[125] Line 9 *arrapatzen nau*, in Etruscan probably *arpetsen: arrapatzen* means literally to seize, but here signifies to accuse. A somewhat analogous case is *iratcheki*, meaning "attacher, joindre," but which in *iratchekitsen nau* signifies "il m'en veut."

artu itchekiri so chitsu: the verb *artu*, to take, receive, is one of the commonest occurrence in the Eugubine Tables. With *itchekiri* compare the attributive *itcherik* in line 4. The Etruscan equivalent for the Basque *gale*, *ille*, *gille* is *sa*, as in *lanesa*, workman, *zekesa*, niggard. This leads me to ask if the word in this group be not *itchekirisa*, he who adheres, an adherent, that is, to the confederacy, rather than *itchekiri so*, the regard of the adherents? The final *chitsu* I read as precedence, from *chitcea*, précéder, a word of Lecluse.

[126] Line 10. *neke nau*, he fails me; *neke* is not the same word as *noku* in line 4, although they agree in signification. It is the Basque *neke*, travail, peine, *nekezi*, disette, *nekatu*, se fatiguer, the original meaning of which seems to have been privation, failure.

emat; the form OII appears in the Eugubine Table I. a, lines 21, 25, and elsewhere, but with auxiliaries. Here it is an infinitive, governed by the preceding verb.

mai asantsi pikor, in Etruscan *pikara: asantsi* I find in Lecluse as *asantatcea*, maçonner, *asantua*, mur, muraille. The *as* must be *aitz*, a rock, used instead of *harri*, stone. This *aitz* is the Japanese *ishi*, a stone. In *pikor* or *pikara* we have a synonym of *ichpi*.

zein gabe, without which, namely, the *pikor* or contribution.

ne belongs to next line.

[127] Line 11. *nabusitze:* the pronoun *ni* is wanting, probably because *nabusitze*, really *nebusatze*, begins with E. As Lecluse says (p. 103): "Tout mot basque, nom, pronom, substantif,

12. **CLENOVN⅃VLOE**[128]
chisanekamabe kago pisamane
zazu neke ambe gogo Pisa eman
have you inability great mind Pisa to give

13. **8ALAM · ⅃IEm8VMLE · FELOINA**[129]
larasarano gounemialpenosane aginsamaukara
lurrez rano goye ni imi albo nas ne aginza mai ekarri
grave towards word I place side together to offering tablet to bring

14. **BINOACALEmVNICLEYmASV**[130]
ulukamaerchirasanemipi kauchisanekumiranobe
al auka ema eritsi ra esan imbe kio zazu naiku mira nabe
Lucumo honour to saying send he does have you desire admiration to extend

---

adjectif, particule quelconque, peut se convertir en verbe en ajoutant *tcea* ou *cea*, selonque le mot est terminé par une voyelle ou par une consonne ; exemples :

bai, oui	*baitcea*, affirmer
aita, père	*aitatcea*, devenir père

Thus *nabusi* makes *nabusitcea;* but the final *a*, representing the article, has no place in Etruscan. It is better to adhere to one mode of orthography; therefore I take the *itz* of Van Eys rather than the *itce* of Lecluse.

lanesa, now *langille:* see note on line 9 for *sa* as the Etruscan termination denoting an agent.

hitz zarratu mara asan Ralapika nen: hitz, word, is governed by *zarratu* which is in the infinitive to *nabusitze*. The common sepulchral *marakara*, *maragogo* is reduced to *mara*, a monument. In *asan* I find an abbreviation of *asantsi* in line 10. The postposition should follow *mara*, but is carried to the end of the clause and follows *Ralapika*. This postposition *neno* in Etruscan seems like a combination of *ne* to, and *no*, of. It answers to the *naino* of *ganaino*. In the Eugubine Tables it is found after names of places as in *arten banion Arretiag neno*, and thus appears to mean "into."

[128] Line 12. *zazu neke ambe gogo Pisa eman: zazu*, in Etruscan *sesu*, 2 pl. imperat. of *dut*. With *neke* it may read "fail ye," or "have ye inability." The only point of grammar to note is the absence of the postposition *ne* after Pisa. This detached passage, perhaps a quotation, seems metrical, a dissyllabic hexameter, so that poetic license may account for the missing *ne*.

[129] Line 13. *lurrez rano: lur* still makes *lurrezko* as well as *lurreko*, of the earth, terrestrial; but here *lurrez* is employed as a synonym of *obi*, the grave.

goye ni imi; goye in Lecluse is conversation. In Japanese it is *kojo*, a verbal message. The following *ni* is the pronoun I, which accompanies the verb *imini*, to place, in an Etruscan form identical with the root, but which may, by a trifling change of the second vowel, have represented the 1 sing. pres. ind. without auxiliary.

albo nas ne: albo nas, see line 4; *ne* is the postposition *to* used as infinitive sign.

[130] Line 14. *Alauka ema:* the translation is literally "power choice given," probably meaning "the elected potentate." In Basque, choice is *auta* or *aukera:* in Etruscan it seems to have been *auku*. This is the *Lucumo* of the Roman writers. The groups which I read *alkamane* in the Hittite Inscriptions, Hamath I. II. and which I translated "I the powerful," may represent this ancient title of authority. The Lucumo is Ralapika.

eritsi ra; infinitive.

esan imbe kio; esan is the present participle, which is really the radical part of the Basque verb. See Max Müller, Science of Language, 2nd Series, Lecture I.; also Lecluse, Manuel de la Langue Basque, p. 63, for the analogy of the English "I am saying, I do say" with the

15. NA/ɅEPMPANC‡LOII8ALMYI · F[131]
karabanetu noturaka chiichsamatalarasanokuu ag
ekarri banetu ondoreak chiotssa emat lurreznokoi ag-
to bring uniting descendants let them to him give tumulus

16. ELOINABVY · NA/ɅEP · /ɅENE‡M[132]
nesamaukaraulpiku karabanetu banekaneichno
-inza mai ekarri al beko ekarri banetu bane kian etsain
offering tablet to bring powerful lords to bring uniting to join he did oppose

---

Basque use of auxiliaries. Celts who speak English imperfectly frequently employ the present participle with the verb substantive instead of the direct present. The verb *imbe* is not Basque, but in Etruscan regularly takes the place of *bialdu* and *irion*. It occurs very often in the Eugubine Tables, and in every case satisfies the sense in this signification. If it be allowable at this stage to suggest etymologies, I would be disposed to see in *imbe* a compound of *imi*, *imini*, to place, and *bide*, a way. In Choctaw *pi* as a radical denotes a way, as in *pimma*, that way, *pillah*, away yonder. The same language renders the Basque *ibilli*, march by *bai-ullih*, of which the latter part is the verb *ulah*, to come. The Basque *ibilli* may by analogy be regarded as a compound of *el*, *eldu*, to come, and a primitive *ib*, *bi*, *be*, the root of *bide*, a way.

The final *kio*, in Etruscan *kau*, is the 3 sing. pres. ind. sign of verbs conjugated without auxiliary.

zazu naiku mira nabe: for *zazu*, see line 12. EY, *neku*, *negu* is the commonest form of *nai*, *nahi*, in Etruscan; it agrees with *zazu*. Of the two following words one must be a noun and the other a verb, but their simple forms do not indicate which is one and which the other. In Basque *mira* means astonishment; but it should rather be admiration. The word *nabe* means a plain in Basque, and *nabari* means to perceive from afar. In Japanese *nobe* and *nobara* designate a plain or moor, but *nobe*, *noberu*, *nobashi* mean to extend, stretch, lengthen, reach out. In this passage *nabe* may mean to extend, or *mira nabe* may be a compound word denoting wide or extensive admiration. The chief objection to the latter reading is that it places the adjective after the noun.

[131] Line 15. *ekarri banetu*, uniting to bring.

ondoreak: it is rare to find M and S representing initial *on*, *un*, which generally require a prefixed I as in IS *ono*, good. In a Celtiberian inscription, however, I have found MP for *ondo*. This *ondo*, though perhaps modelled upon the Spanish *hondo*, deep, is a genuine Basque word. In Japanese it is inverted as *ato-ni*, with the significations after, behind, posterity, descendants, remains, ruins. This Japanese *ato-ni* is to *ondo* as *issho-ni* is to *nas*. The Circassian *yeytahney*, after, agrees with the Japanese *ato-ni*. It is most improbable that a loan word should have so many compounds as *ondo* has in Basque.

chiotssa emat: I do not know *chiotssa*, or more correctly *chiichsa*, as a Basque pronominal auxiliary. He them to him does, is *diotza;* they it to him do, is *cioten;* and let them do, is *bezate*. I suppose *chiichsa*, *cietssa*, *cietsza*, to be a compound imperative, "let them to him do." For *emat*, see line 10.

lurreznokoi: *lurrenokoi* and *maranokoi* have appeared in the short inscriptions. I have queried *koi* as answering to the Japanese *koya*, a small house or chamber. Thus *lurre* has virtually two genitive signs like the Basque *lurrezko*. An earthen chamber must be a tumulus, the common mark of honour to the dead among the Khitan, as seen in the Pictish barrows of Britain, and the mounds of Siberia and North America.

[132] Line 16. *aginza mai ekarri al beko:* *al* is probably here used as an adjective, powerful, rather than as a noun denoting the Dominion in the genitive to *beko*. For *beko*, see notes on Left Side of Cippus, line 21. It must be in the plural without sign.

ekarri banetu, uniting to bring.

17. mASV · ACNINA · CLEL · A8VNAFEL[183]
miranobe rachikaukara chisanesa ralapikara aginsa
mira nabe eritsi kio ekarri zazu antsa Ralapika ra aginza
admiration to extend opinion he does bring have you care Ralapika to offering

18. OINAMLEP‡INA · INYEmAmE[184]
maukaranosanetuichukara ukakunemiramine
mai ekarri no izanda etsai ekarri uka gune mira imini
tablet bringing of perhaps enmity it brings refuse us to consideration to place

19. P · CNL · FELOINA · ‡IANAYENE[185]
tu chikasa aginsamaukara ichurakaragunekane
du zekesa aginza mai ekarri etsai erakarri gune kian
he does niggard offering tablet to bring enmity cause to bring us to he did

20. YESNE · ESA · FELOIANOVDAMO[186]
kunenokane neuora aginsamaurakamapituranoma
gune noku ne ni narri aginza mai rako ambe Turano ema
us to fails who me incites offering tablet towards great Tyrrhenia gift

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bane kian etsain: bane for *banetu*, to join; *kian*, 3 sing. imp. ind. of verbs conjugated regularly, united with *etsain*. I cannot account for the difference of form in *etsain*, here ‡M, and on Left Side 9-12, 17-20 ‡E. Judging by the context they are the same words.

[183] Line 17. *mira nabe:* see line 14.

eritsi kio ekarri: eritsi or *eritzi* is here, as in Basque, a noun signifying, opinion; *kio ekarri*, he brings.

zazu antsa: for *zazu*, see line 12. Here again is *antsa* instead of *ansi*, care.

Ralapika ra aginza mai ekarri no, of bringing a tablet of offering to Ralapika.

[184] Line 18. *izanda etsai ekarri* or *akar: izandaite* (Lecluse), perhaps. For *etsai*, see Left Side, line 21. The defective Etruscan syllabary marks no distinction between the participle *ekarri* and the 3 sing. pres. ind. *akar*, now *dakar*.

uka gune mira imini du: uka is the verbal form, now *ukha, ukatu*. The substantive form is *uko*, Left Side 17-20. The auxiliary of *uka* is at the end of the sentence, *du*, he does. The pronoun *gu* is in the dative, to us. In this case *mira* is a noun, regard, consideration. The verb *imini* is in the Etruscan infinitive; otherwise *imi* would suffice.

[185] Line 19. *zekesa* is formed from *zeken, cheken*, stingy, penurious, by replacing the final *n* with the Etruscan mark of agency *sa*. See *lanesa*, line 11. It is here vocative.

etsai erakarri gune kian: erakarri, cause to bring, *kian*, he did, *gune*, to us. Perhaps Pisa persuaded some of the minor powers to refuse contributions.

[186] Line 20. *gune noku ne*, to us who fails.

ni narri: the Etruscan has the same form of the pronoun E, *ni* or *ne* for the nominative and accusative, but oblique cases change it to S, *no*. The verb *narri* is now *narritatu*, incite, annoy.

aginza mai rako: rako, in Etruscan *raka*. is a synonym of *rano*.

ambe Turaan ema: ema for *emasa*, in Basque *emaitsa*.

21. AVPABELVYESNED.ΛMNECEI[137]
rapitura ulnesapikunenokaneturanokanechineu
arrapatura Alin azpi gune noku ne Turano kian eznai
accept to Dominion under us to fails who Tyrrhenia he did despise

22. YESNMYEIMDAMNEMJLIMOM𐌀[138]
kunenokanokuneunoturanokanenogoumimonoba
gune noku naga ne on Turano ganaino goye imi ema no ba-
us to fails hates who good Tyrrhenia towards word place giving of

23. ELOVYAMCVNAA8VNAMENA[139]
nesamabekuranochipikararalapikaraminekara
-nais ambe gure aiutzi pikor Ralapika ra min ekarri
I am very desirous to inform contributions Ralapika to grief bringing

24. BEN · NA𐌀EP · CICNLBAPEVYVME[140]
ulneka karabanetu chiuchikasaulartunepikupinone
Alin ka ekarri banetu chehe zekesa ahal arten bu jabenen
Dominion by to bring uniting little niggard contempt receive does of the lords

---

[137] Line 21. *arrapatu ra: arrapatu*, in Etruscan *arpetu*, *erpetu*, is often used as a synonym of *artu*, to hold, receive. The *ra* marks the infinitive to *narri*.

Alin azpi gune noku ne: Alin, the dominion, *azpi* under, *gune*, to us, *noku*, fails, *ne*, who.

Turaan kian eznai: there is a change of tense which I have elsewhere observed in Etruscan construction, but cannot account for. The preceding *noku* is in the present, while *kian* marks the past of *eznai*. As for *eznai*, literally, to wish not, it is not Basque so far as I know. An analogous form *ez-ezerten artu* means, to despise. The Japanese forms verbs of contempt and dislike with *iya*, the equivalent of *ez*, such as *iyagari*, *iyashime*. The Choctaw does the same with *ik*, *ikahninchoh*, *ikahobuloh*.

[138] Line 22. *gune noku naga ne on Turaan ganaino*: for this peculiar construction see line 4.

goye imi ema no: for *goye imi* see line 13; *ema no*, of giving.

[139] Line 23. *banaiz ambe gure aintzi:* for *banaiz* = *naiz*, see Left Side 1-4. The following *ambe*, great is an adverb qualifying *gure*, very desirous. This *gure* governs the preceding clause, *goye imi ema no*, and on the *goye imi* depends *aintzi*, to warn or make known.

pikor Ralapika ra min ekarri; for *pikor*, contribution, see line 10. The Basque *min*, Etruscan *mine*, means grief, pain, and desire. This must be read: "the contributions bringing (testifying) grief to Ralapika."

[140] Line 24. *Alin ka*: *ka* is the postposition, by. Thus it reads: "By the dominion, *ekarri banetu*, uniting to bring, *pikor*, &c., contributions."

chehe zekesa: for *zekesa*, see line 19. The preceding *chehe* means little, a synonym of *chipi*. In Etruscan *chipi* is used in a good sense, *chehe*, in a bad.

ahal is the same in form as *ol*, *ahal*, power, but here, as in the Eugubine Tables sometimes it signifies shame; contempt, being the radical of the present *ahal-ge*.

arten bu jabenen: the verb *artu*, *artzen*, is here *arten*, the Etruscan equivalent of the latter. The accompanying auxiliary is Etruscan *be*, but I have represented it by *bu* as that 3 sing. imperative form is the only one in Basque which preserves the old synonym of *du*. The Etruscan has *beno* or *pino* for "he did," answering to the modified imperfect *banu* in Basque. The form of *banu* or *beno* in the present tense in Etruscan was *be*. *Jabenen*, in Etruscan *gubenone*, is the genitive plural.

CLOSE TRANSLATION OF THE CIPPUS OF PERUSIA.

Left Side.

For bringing a tablet of offering I requested the contributions of the accordant states, *saying:* I am causing a tablet to be made towards the grave, *and* on the side I am giving information, as to who chose to bring disesteem *to* the tablet of offering. Only (one) fails to honour. Instead he warned the lords to oppose to communicate the contributions I requested. Of these subjects of Rome bearing united memory towards Kalapika, bringing a tablet of offering causing to be seen *their* great regard for Ralapika, I desire the inimical lord to bear the scourge, considering the signification of the tablet. The refusal of the gift of Pisa throws the spark of enmity at the prince.

Front.

I, desiring to cause the mind of Pisa to be placed under adhesion to the writing of the States, declare *by* suitable writing *the intention* of bringing a tablet of offering. I instructed him (the ruler of Pisa) together caring (testifying regard) to care for Ralapika, giving attention *to this, that* instead of *them* adhering to us I take part together with them. He who fails us shows enmity towards good Tyrrhenia, causing to be seen towards the grave the twelve united states of the Dominion.

Pisa gives warning to the Union of the care of great Tyrrhenia to bring a tablet of offering. To myself Pisa refuses the contribution I requested instead of honouring *his* master *and* lord. He accuses me of bringing the tablet of offering *in order* to gain the precedence of the adherents. He fails to give me a contribution to erect the tablet, without which I command the workman to write the word *on* the monument erected to Ralapika:

"BE YE UNABLE TO GIVE A GREAT SOUL TO PISA."

I give word to take part together to bring a tablet of offering towards the grave to honour the Lucumo. He sends, saying: "Do you have the desire unitedly to bring an extensive spectacle, *but* let *his* descendants give him a tumulus." He opposed joining the powerful princes uniting to bring a tablet of offering to extend admiration. He brings *his* opinion: "Do you have a care of bringing a tablet of offering; perhaps it brings enmity." He refuses to pay us consideration, the niggard! Bringing a tablet of offering he caused enmity to be brought to us. He who fails us incites me to accept the gift of great Tyrrhenia towards the tablet of offering. He who under the Dominion fails us despised great Tyrrhenia. He who fails us shows enmity towards good Tyrrhenia.

I am very desirous of giving *command* to place a word setting forth the contributions bringing (testifying) grief towards Ralapika. By the Dominion uniting to bring *these*, the little niggard receives the contempt of the lords.

The following inscription is found in Lanzi, Vol. II., p. 438, No. xxiii., but is given with the emendations of Fabretti. It was found in a tomb about two miles from Perusia, although the subject of the epitaph was a native of Sena:

TOMB OF SARAPIKUKA.

1. FEBEN · SVOI · BINOIV · OVEM · SIANM · EYFE · OAVDE[141]
agin ulneka nobemau ulukamaube mapineno nourakano nekuegin marapitune
agin Alinka nabe mai Alaukama obe Ampineno nau rakone naiku egin mara epaten
offered Dominion by extended tablet Lucumo lord Ampineno he me does approach desiring to make monument to fix

2. LAVYNEMCLE · CADESDI · AVLEM · LAPIAL · ΛDECVOVDAMI[142]
sarapikukaue nochisane chiratunenotuu rapisaneno saratuurasa batunechipi mabeturanou
Sarapikuka ne aintzitzen jardun natiu arrapatzen no zarratu au eritza batu inyubi ambe Turanoi
Sarapikuka to to present pay attention they me do taking of writing this honours army beloved great Tyrrhenia to

---

[141] Tomb of Sarapikuka.

Line 1. *agin Alin ka: agin* is the verb, to promise, command, offer, which forms *aginza*, offering. For *Alinka*, see Cippus of Perusia, Front, line 24.

nabe mai: *nabe* is here an adjective, extended, great.

Alaukama obe: for *Alaukuma* see Cippus, Front, line 14; for *obe* see Cippus, Left Side, 17-20 The whole is equivalent to "the lord Lucumo," who is not in this case the subject of the inscription.

Ampineno or *Mabineno*, the name of the Lucumo.

nau rakono: the common pronominal auxiliary *nau* indicates that the postposition *rako* with the increment *no* has become a verb, meaning "he towards, or approaches me."

naiku egin: for *naiku* see Cippus, Front, line 14. FE may be *agin*, command, as well as *egin*, make.

mara epaten: for *maru* see Cippus, Front, line 11. The following VDE I read as the Basque *epaten*, fix a limit. If *mara* represent the modern *marra*, the two words will mean "to set a mark."

[142] Line 2. *Sarapikuka ne aintzitzen: Sarapikuka*, the name of the deceased general, in the dative to *ne*. The verb *ainzindu*, to go before, seems in Etruscan to have assumed an infinitive form *aintzitzen*, meaning to present, combining *praesum* and *praesento*.

jardun natiu: the common Etruscan verb CA, *chira*, *zira*, more fully CADE, *chiratune*, *ziratune*, I have already referred to several times. It means "to pay attention to," and thus connects with the modern *jar*, attention I am not aware that *jardun*, which generally means "to be occupied," ever conveys such a notion, yet as corresponding in form I have taken it to represent *chiratune*, which stands in this place for "compliment, do honor."

The auxiliary is the plural of *nau* in Etruscan, which in Basque is *naute*. As in Basque *nuen* makes in the plural *nituen*, so in Etruscan *nau* made *natiu*.

arrapatzen no: in Etruscan *erpetzen no*, of taking.

zarratu au eritza: the construction is not clear. One would expect the infinitive *eritzi* rather than the indicative *eritza*. The demonstrative *au*, *hau*, this, must stand for the personal pronoun.

batuinyubi: in the Eugubine Tables *batu* is one of the commonest words and unmistakably denotes "an army." It is not found in Basque, but *pampots*, brave, *farfatzea*, strike, *bota*,

3. LADOIALISFLE · CESYNAL · CLENAPAMI · EO · 8ANV · LAVYN[143]
saratumaurasauno-agsane chinenokukarasa chisanekara turanou nema larakabe sarapikuka
zarratu mai eritza on agisa ne Senanako sortze etsitzen ekarri Turanoi ni ema *lara*gabe Sarapikuka
written tablet honours good commander which Sena born honour to bring Tyrrhenia to I give (permission) Sarapikuka

4. ΛPΞCVM · IΛA · mVP‡VA · CEDVDVm · EIN · BEC‡DI[144]
batunechipino ubara mipituichpi ra chinetupitupimi neuka ulnechiichtuu
batu inyubi no obi ra *imbetu* ichpi ra Sena *tobe tobe* imi nayago Alin che itsatui
army beloved of grave to send contributions to Sena instead instead to place I desire Dominion even adhering to

5. YVNVP · CLVYFA · ‡ELVP * * * * p[145]
kupigabetu chisapiku ager ichensapitu * * * * tu
jabe 8abetu etsitzbeko agerri——— —————
lord deprived appreciative regard to manifest———

---

butatu and *abaztorra*, drive away, repulse, seem to preserve the root *bat*. The corresponding Japanese word is *butsu*, to strike, whence comes *bushi*, a soldier.

The following word in Etruscan is *nechipi* or *inchibi*. It may answer to the Basque *nehabe*, a servant, or be a compound of *ansi*, as *ans ibe*, one who cares for, or represent *inyubi*, great desire. For the present I translate it as the beloved or darling of the army.

ambe Turaani: for *Turaan*, see Cippus, Front, line 5. The word is here in the dative without postposition to *arrapatzen*.

[143] Line 3. *zarratu mai eritza on agisa ne:* *eritza* is in 3 sing. pres. ind. agreeing with the relative *ne* at the end of the clause, its antecedent being *zarratu mai*. The Etruscan *agisa*, formed from *agin* as *lanesa* from *landu* and *zekesa* from *zeken*, is a synonym of the commoner *agintzari*, a commander.

Senanako sortze: Sena takes an additional *n* before the genitive *ko;* compare *Bayonako*, of Bayonne.

etsitzen ekarri Turaani: this presents what in Etruscan is an unusual form of *etsi*. It is Basque however. Turaani is dative as in line 2.

ni ema, I give.

laragabe is an enigma. It seems to be a negative expression composed of *gabe*, without, having the positive meaning, permission. In Basque permission is *baimen* or *zilhegi*. In the Eugubine Tables *menimi* represents *baimen*. Perhaps *laragabe* is literally "without opposition," but I do not know with what Basque word to connect *lara*.

[144] Line 4. *obi ra imbetu ichpi ra:* for *obi*, see Cippus, Left Side 1-4, and for *imbe*, Cippus, Front, line 14. This is the first appearance of the full form *imbetu*, which with *ichpi*, contribution, constitutes a compound verb, with *ra* as the sign of the infinitive.

Sena tobe tobe imi: for *tobe*, see Cippus, Left Side 9-12. The first *tobe* qualifies Sena; the second apparently forms a compound verb with *imi*.

nayago: see Cippus, Left Side 17-20. It has comparative power: "I prefer."

Alin che itsatui: the *che* means "even." The noun *itsatu*, here in the dative, shows the root *itsat* of *itsatsi*, *atzitu*, hold, seize, but which in *itsaskor* means, adhere. Thus *itsatui* will mean, "to the adherents."

[145] Line 5. *jabe gabetu: gabetu* means deprived. Here it should signify departed. The Basque uses *zen* for late, defunct, answering to the Iroquois *kenha*. The Japanese *shini*, death, agrees.

CLOSE TRANSLATION OF THE INSCRIPTION ON THE TOMB OF SARAPIKUKA.

An extensive tablet offered by the Dominion the Lord Lucumo Ampineno approaches me desiring to make, to set up a memorial to present to Sarapikuka. They do me the honour of taking to great Tyrrhenia the inscription *which* honours the beloved of the army. The written tablet which honours the good commander I willingly allow Tyrrhenia to bring to show regard to the native of Sena. Instead of Sena I prefer to grant to the adherents of the Dominion to send contributions to the grave of Sarapikuka, the beloved of the army, to manifest *their* appreciative regard of the departed lord.

The last inscription I present is that on the leaden tablet of Magliano, which has been variously read by Deecke, Bugge, and Pauli. The text is apparently corrupt, and many characters are confessedly uncertain. The meaning, however, is evident.

THE LEADEN TABLET OF MAGLIANO.

Front.

1. CAVOAS · YVOIV · AFILS · LXXX · E‡ · JIMOM [146]
chirapimarano kupimaube raagusano 80 neitch goumimami
zeru pimo rano Kupima obe irago atsono 80 ni itch Goumimami
heaven first towards Kupima lord passing age of 80 I thank Goumimami

2. CASOIALO · LACO · BEFN · AFIL · NENL · MAN [147]
chiranomaurasama sarachima ulneagka raagusa kanekasa miraka
jar no mai eritza ema —— alin egi ka irago atso kian — miraka
attention of tablet honours to give —— authority exercising in pass age he did — seeing by

---

etsitz beko agerri: for *etsitz*, see line 3. I regard *etsitz* as an adjective, meaning appreciative, but only on the authority of analogy. VY *beko*, I suppose an abbreviation of VNY *begogo*, consideration, regard. Some such meaning seems to be required by the following *agerri*, to manifest.

[146] Leaden Tablet of Magliano: Front.

Line 1. *zeru pimo rano*: *zeru* Basque, heaven; Lesghian *ser*, *sur*; Japanese *sora*; Iroquois *koronhia*. The following *pimo* is the Etruscan one, here used as "first." *Kupima obe*, may be the lord of Kupima or lord Kupima, the living subject of the inscription.

irago atso no: the common formula for stating age, the *avil* of Etruscologists, which with *ril*, Niebuhr thought to be the only words satisfactorily translated. In Etruscan it is *irag* rather than *irago*. For *atso*, see remarks under Lanzi 46. The following *no* is the postposition of.

ni itch: *ni* is the pronoun, I. The verb *itch* only exists in Basque with the significations shut, leave, and as the root of *icheki*, hold. I suppose an old meaning, to thank, as the root of *es-ker*, thanks, gratitude. The Japanese has *sha-suru*, to thank.

Goumimami, the name of Kupima's colleague and successor, see lines 4, 5.

[147] Line 2. *jar no mai eritza ema*. Owing to the uncertainty and obscurity of the next group, I translate this one according to the analogy of the last group in line 4, the meaning of which is clear. It seems from it that *eritza* is an attributive or adjective form, unless it stands in the genitive of position to *mai*, when it will be a substantive.

3. mVPINAMIE · FALYAOI · AISEPAS · IN · ECS · mENE[148]
mipituukaranoune agersakuramau raunoneturano uka nechino minekane
———————— agerri askor mai irion ne Turano uka ni che no imini kian
———————— manifesting joy tablet send to Tyrrhenia refusing I self of place did

4. mLAOCEmApNI · YVOI · YIV · ⅃Imom · CAOIALOI[149]
misaramachinemiratukau Kupimau kuupi goumimami chiramaurasamau
misa erama zein miratu kio Kupimai koi bu Goumimami jar mai eritza mai
monument to bring which show does Kupima to desire has Goumimami attention tablet esteem tablet

5. AO · mAPIML · mENIYLA · AFPS · CI · ALAO · ⅃Imom[150]
rama miratuunosa minekaukusara raagtuno chiu rasarama goumimami
erama miratu au aintza men zahako zari irago du no sei urte erama Goumimami
to bring to show this predecessor power besides chief pass does until 6 years to bear Goumimami

---

alin egi ka, literally, by doing sovereignty, that is, in exercising authority.

irago atso kian kasa miraka: kian, he did, belongs to *irago*. The final *mira-ka* means "by beholding," but probably forms an idiom with the untranslated *kasa*, signifying "rarely seen."

[148] Line 3. *mipituukaranoune:* the first part of the group is plainly *imbe*, send, or it may be *imbetu*. If *imbe*, then *tuu* is *dio*, he to him does. The sentence is obscure owing to the uncertainty of the last characters and the blanks I have been compelled to leave in the preceding line.

agerri askor mai: here also Y is doubtful. Also I question the propriety of reading LYA, *askora* which now means, joyous, but can suggest no better reading.

iraun ne Turaan uka: iraun means to continue, preserve, extend. The true equivalent of AIS is probably *irion*, to send. The *uka* following *Turaan* is the verb, to refuse.

ni che no imini kian; I of myself did place. Here *imini* means decide.

[149] Line 4. *misa erama zein miratu kio*: *misa* is a new word, unknown in Basque, but connecting probably with *mira* like the Japanese *mise*, an exhibition. It is a common word in the Lycian inscriptions, constituting the first part of the words hitherto read *mete*, *mene*, and translating the Greek *mnema*. The verb *miratu* has here the meaning to show. *Kapimai* is in the dative.

koi bu: Etruscan *be*, as I have already sufficiently indicated, is the equivalent of Basque *du*. The preceding *koi* now means desirous, but here forms a verb with *be* = he desires.

jar mai eritza mai: tablet of attention, tablet of esteem. See line 2.

[150] Line 5. *erama*, in infinitive to *koi bu*.

miratu au aintza: the sense is not clear. I read *cintza* as predecessor, from *aintzindu*, precede. It may be a synonym of *eritza*. If it means predecessor, the dative sign is omitted.

men zahako zari: this also I give with hesitation. After *men*, power or authority, comes *kahako* and then *zari*, a chief. The Japanese *hoka* means other, besides, outside, answering perfectly to the Basque *zahako*, outre. I suppose therefore that this is the only way in which the Etruscan indicated a colleague, namely as "another lord of authority."

irago du no: the Etruscan had the auxiliary *du* as well as *be*, but I have not yet discovered any rule for their respective employment. The final *no* I regard as the postpositive until, (Lecluse, Manuel, 112).

6. AFILSL · ECA · CE/ΛEN · YVOIV · OVL · ILVYEFP · BESNI [151]
raagusanogo nechira chinebaneka kupimaupi mapigo ugopikuneagit ulnenokau
irago atso nagi ni che ra zein bane ka Kupima obe mopigo ogoi bakan egit alin no kio
passes age idle myself to who joining by Kupima lord twice 20 alone exercise authority of does.

7. mVLFENI · EO · YVCI · Am · APS [152]
mipisa agin kau nema kupichiu rami artuno
imbesa agin kio ne ema jabetzio —— artu no
messenger command he does me to give to rule —— receiving of

Reverse.

1. mL4OAN · CALVSC · ECNIA · AFIL · mImENICAC [153]
misaramaraka chiraspinochi nechikaura raagusa miuminekauchirachi
misa erama rako jarritza banuche anzeko hiri irago atso imini kio jarritze
monument bringing towards request I did self like cities passing age little place he does attention.

---

chiu arsa erama, or in Basque *sei urte derama*, six years to bear. The subject is Kupima; the double object, Goumimami and *men zahako zari*, in apposition.

[151] Line 6. *irago atso nagi*: I read SL *nogo* as the Basque *nagi*, idle, but in the good sense of the Japanese *nagu*, Choctaw *nukchito*, calm, quiet. The verb must be in the 3 sing. pres. ind. without sign.

ni che ra zein baneka: *zein* is the subject of *irago*, the rest being an adverbial clause. One would expect to find Goumimami speaking of Kupima joining the younger man to himself in authority. On the contrary, he says: "who, by uniting to myself, passes a quiet *old* age." In *bane* we have the shorter form of *banetu*, Basque *batu*, followed by the postposition *ka*.

mopigo ogoi bakan egit alin no kio: *mopigo* is the Etruscan twice, from *mopi*, two. The final *go* answers the purpose of the Basque *etan*. In *bekune* we have already found the Etruscan equivalent of the Basque *bakar* and Japanese *bakari*. The verb *egin* becomes *egit* as in *egiten*, and finds its auxiliary at the end of the sentence. Also, differently from the *alin egi ka* of line 2, *alin* takes the postposition *no*, of.

[152] Line 7. *imbesa agin kio*: *imbesa* is formed like *lanesa* and *zekesa* of the Cippus. It means, a messenger, and is probably the original of the word embassy. Here the word may denote an officer of the Confederacy: see Reverse, line 3. There is no distinction in Etruscan between *egin* and *agin*, both of which are represented by FE. The context determines that the verb here is *agin*.

ni ema jabetzio rami artu no: instead of *ni* one would expect *no*, as *eman* governs the dative. The word *jabetzio* is a form of *jabetu*, to rule or command. It is in form like *ichpichio* of the Cippus. The following *rami* is an enigma. The same characters Am in the Eugubine Tables frequently give the Etruscan equivalent of the Basque *irrin*, division, showing that the Basque here as elsewhere has changed final *m* to *n*. The sense of the passage rather favours the idea that, having shared the authority for six years, Goumimami was now to rule alone. In one of the bilingual Lycian inscriptions I find *ramira*, translated by the Greek *panta*. This would connect it with *arrunt*, rather than with *irrin*. The Basque *arrunt* means commonly, but also "all without exception," and thus answers to the Japanese *aremashi*, in the main, generally. The verb *artu* is in the genitive to *ema*.

[153] Reverse:
Line 1. *misa erama rako*: for *misa*, see Front, line 4.

2. MAPCALVPCAC · EOYVOIVNESL · MAN · PIFAL[154]
miratuchirasapituchirachi nemakupimaupikanenosa miraka tuuagergo
miratu zeru kupida jarritze ni ema Kupima obe kian aintza mira ka dio agerri go
to show heaven compassion attention I give Kupima lord did present beholding by it him inform will

3. LECEM · YNVCASI · MVPISES · YEIS · EFIYVDAS · MVLSLE[155]
sanechinemi kukapichiranou nopituunoneno kuneuno neagukupiturano mipisanosane
zuen zein imi egoki ——— nabetu ona nion gune ona ni age jabe Turano imbesa aintza ne
did who place suitable ——— extend goodness I him did to us goodness I inform Tyrrhenia messenger presents who

---

jarritza banu che: it is hard to say why we have *jarritza* rather than *jarritze*. *Banu che*, in Etruscan *beno che*, I myself did.

anzeko hiri: the city of Kupima and Goumimami is not mentioned. The root of *anzeko* is *anz* or *antz*, resemblance, connecting rather with the Japanese *nise-ru*, to make like, than with *onaji*, like.

mehe imini kio jarritze: mehe, little, slender, lean, probably the same as the Lesghian *mici*, *mitshi*, and Georgian *smia*, little. Here *jarritze* seems like *jar* to be a noun governed by *imini kio*.

[154] Line 2. *miratu zeru kupida jarritze: miratu* again means to show; see Front, line 4. Heaven, *zeru*, is personified; it is doubtful that the Etruscans had a deity of this name. Yet in Lanzi, Vol. II. Tav. VI., p. 6, an angel is called LASAFRLV *sarunoru agintzabe*. The latter word *agintzabe* should mean a servant or messenger. In the Eugubine Table syllabary C does not appear, so that L does duty for all powers of *s*. If it be so in the case of LASA, as seems probable from the rare appearance of C, we may read *zerunora*.

The word *kupida* may in Etruscan be read *supida*. The corresponding word in Japanese is *itawashii*. These three forms *kupida*, *supida*, *itawashii*, suggest as the Etruscan original *zupida*, inasmuch as *z* may easily, by laying stress on the dental element, become *t* as in Japanese, and the permutation of *z* and *k* is not uncommon in Basque. For *jarritze* see line 1.

ni ema kupima obe kian aintza: this is one of the numerous instances in which the Etruscan exhibits the entire independence of its various parts of speech. The pronoun *ni* is separated from the auxiliary *kian* by three words, and *aintza*, which means either a present, or precedence, and is the direct regimen of *ema*, follows it at a similar distance. I cannot account for the absence of the dative sign after *kupima obe*. It must be understood.

mira ka dio agerri go: the only words needing explanation are *dio* and *go*. The former is the Basque auxiliary with included pronouns "it him does," The Iroquois has the same complex system of included pronouns; e.g. *rak*, he me does, *tak*, thou me dost, *kon* I thee do. The Japanese entirely dispenses with such pronominal refinements. The final *go* is the sign of the future tense in Etruscan, as it still is in the Spanish Basque dialects Another Basque future suffix is *en* answering to the Japanese *n*. The Iroquois future suffix is *en* or *ne*: that of Choctaw, *ching*.

[155] Line 3. *zuen zein imi*, literally, did who place. Here the Etruscan uses the common Basque 3 sing. past indic. of *dut*.

egoki pichiranou. This expression I cannot explain. YN in Etruscan as regularly denotes *egoki* as NY gives *gogo*.

nabetu ona nion: nion Basque, I him did; *nabetu*, extend, here seems to mean, publish widely. The inherent dative of *nion* combining with *ona*, goodness, to make "I to him the

4. MLAL · ILALE · YINS · LVPSO · YEF[156]
misarago usaragone kuukano sapitunoma kuneag
misa rako atso rakone goijaun kupida no ema gune ag-
monument towards ago acknowledging high lord compassion of gives
us to

5. AVFIOVN[157]
rapiagumapika
-erri Begiaumabeka
manifestation ——— ———

6. LVDSOSAL[158]
sapitunomanorasa
kupida no ema no eritza
compassion of giving me he honours

7. E8DS · NAC[159]
nelatuno karachi
ni lotu no ikheretsi
me joining of to show gratitude

---

goodness widely proclaimed," in English idiom gives the possessive, "I widely proclaimed his goodness."

gune ona, goodness to us, a case of anadiplosis.

ni age jabe Turano imbesa aintza ne. The verb *age*, root of *agerri*, in Etruscan means inform. I think *jabe* and *imbesa* are in apposition, the lord, the envoy of Tyrrhenia, that is the representative of the Confederacy or Dominion, appointed probably by the Lucumo. I read *aintza ne* as "who presents."

[156] Line 4. *misa rako*, towards the memorial.

atso rakone: the final *ne* seems to change the postposition *rako* into a verb. In the Eugubine Tables *rano-ne* is similarly employed, meaning to approach, join, yield to. recognize, be of the same party. Here *rakone* seems to signify acknowledging or paying respect to.

goi jaun: this inversion of *jaungoi* or *jaungoiko*, the name of divinity among the Basques, has already appeared in these pages in connection with votive inscriptions. It is in the genitive of position to the following:

kupida no ema: for *kupida*, see line 2. It is in the genitive governed by *no*. The verb *ema* has *ne* at the end of line 3 for its subject. It governs the following *agerri*.

gu ne agerri, to us declaration.

[157] Line 5. *begiaumabeka:* the first part is probably *begi*, eye. It may be the name of a god or an old form for Providence; *nescio*.

[158] Line 6. *kupida no ema:* see lines 4 and 2.

norasa, may be for *nau eritsi*, he honours me.

[159] Line 7. *ni lotu no*: the verb *lot*, *lotu*, *lotzen*, now means to bind. In Etruscan it had a more extended signification, being a synonym of *banetu* in the Eugubine Tables. The Choctaw *hollotti* means bound; but many words of similar form, like *hlitoha*, mean unbound.

ikheretsi or *ikherreste* in Basque means gratitude. In this place it seems a verbal form, namely *eritisi*, preceded by *ka*. As a noun the Basque *ikherreste* is a synonym of *esker*. The original signification of *etsi*, whence *onetsi*, *eritsi*, *ikerhetsi*, *gaitzetsi*, is given, I think, in the Choctaw, which has a verb *eshih*, *ishih*, *isht*, meaning to hold, receive, take. In Basque *artu* has superseded *etsi* in these original senses of the word, but in composition it may be detected

CLOSE TRANSLATION OF THE LEADEN TABLET OF MAGLIANO.

Front.

To Heaven first I, Goumimami, render thanks for Lord Kupima passing the age of 80. The tablet of regard to give honour ——— in the exercise of authority he passed an age *rarely* seen. ——— Tyrrhenia refusing to send a tablet expressing gratulation, I of myself resolved to bring a monument which shows *that* Goumimami has the desire to provide a tablet of regard, a tablet of honour to set forth his predecessor. Until he passes six years having Goumimami *as* colleague, by which union to myself he passes a quiet *old* age, the lord Kupima exercises authority alone forty *years*. He commands the envoy to give me *the power* of receiving *entire* authority.

Reverse.

I myself requested the coördinate cities *to help* towards bringing the memorial. Little does he care for attaining *so great* an age. To pay regard to the compassion of Heaven I gave Lord Kupima *this* offering. By beholding, it will inform him who placed a suitable ———. I published abroad his goodness, *his* goodness to us. I inform the lord, the envoy of Tyrrhenia, *that he* who presents towards the memorial, acknowledging the age, gives us an indication of the compassion of God. ————— giving of the compassion, he honours me by joining me to show gratitude.

I conclude this paper with a transliteration of the groups of characters contained in the Augurial Templum of Piacenza to which allusion has been made on page 222. This I do in the hope that scholars possessing a better knowledge of Basque and of the subjects likely to be set forth in such a Templum than I possess may be able to shed light upon it. The Templum consists of a number of compartments indicated by a double series of numbers as follows:

1. ANI ONE rakau makane ? raka = argi, light.
2. VNI ΩAD pikau baratu pikoya burdax, end of the plough
3. YEO FΩ kunema agba See 13′ gune ema *agba*, place gives ——
4. LEON sanemaka See 9
5. EO nema
6. CAO chirama zeru ema

---

as the verbal termination—*tze-tzen*, just as *artu* appears in—*artze-artzen*. To gain the heart is in Basque *goga-tu*, *goga-tze* ; in Choctaw it is *chukush-eshih*. Thus *on-etsi* originally meant to hold good, and *gaitz-etsi*, to hold bad, and *etsi* is but another form of *atchiki*, to hold. Also *er-itsi* may be derived from *arau*, rule, right, proportion, fitness, with the original signification to hold aright or fitly. It is only by careful and full comparison of words and constructions in the different Khitan languages that the radicals can be detected and a scientific system of etymology be made to take the place of conjecture.

7. 8V8LVSLNC alpilasapinosakachi ; ilbeltz bena sokache ; ilbeltz = moon, January.
8. IFN uagka
9. LEONE sanemakane See 4, 17, 2′, 9′.
10. YLVSCF kusapinochiag ; eguzbena *chiag-* ; eguz = eguzki, the sun.
11. CE chine
12. CFLALΛ chiagsarasaba ; compare final chiag of 10
13. FEYISL aginkuunosa
14. CILENSL chiusanekanosa
15. YINCILEN kuukachiusaneka
16. YINOF8 kuukamaagla see 1′
17. LEOAΩ sanemaraba
18. ΩAPS baratuno
19. OEPCL manetuchisa
20. O ma
21. NΛ gaba ; gaba, gau, night
22. LEYA sanekura
23. ΩAPISL LAO baratuunosa sarama
24. O ma
1′. YIHS OF8 kuukano maagla ; Goi-jaun makilla, the sceptre of God
2′. LEON sanemaka see 4. 9. compare 17, 9′.
3′. N ka
4′. LASL saranosa
5′. 8V8LVS alpilasapino ilbeltz beno compare 7 and 10
6′. CAOA chiramara, zeru marra, heaven limit = the horizon
7′. CILEN chiusaneka see 14
8′. SELFAN nonesaagerka ; non su agerri ka, where fire manifest ?
9′. LEOΩS sanemabano
10′. YLVSC kusapinochi ; eguzbena che
11′. LFSL FELL saagnosa aginsago ; su eginsa aginza go, the burner of offerings
12′. SAYPES norakutuneno ; nora gedenen, to the four quarters
13′. OEYLFΩD manekusa agbatu ; eman eguz *agbatu*, gives the sun——
14′. YLVSC AΛC kusapinochi ; rabachi eguz bena che &c.
15′. YI O SO kuu ma noma
16′. OV8LOAS mapilasamarano ; mopila sa mora-no, the eighteenth

The translations I have suggested in a few cases are merely hints. Of 16′, *mopila sa morano,* I can speak more confidently. It is the only numeral which I recognize as such. No. 21 *gaba* is, I think, correctly rendered by the Basque *gau, gaba,* night. Also 6′ *zerumara* or in Basque *zeru marra,* the line or limit of the sky, should mean the horizon. No. 1′ *Goi jaun makilla* should be *sceptrum Jovis* but in note 38 (translation of supposed alphabet) *makilla* is written OL8, not OF8. In 7 and 5′ *ilbeltza* appears, and may indicate the moon in some phase; literally it means "black month" and now denotes January. In 10, 10′, 14 *kusa* may stand for *eguzki*, the sun. Egubena for *egunbena* or *eguzbena* denotes the fifth day of the week, Thursday, in Basque, but its derivation is obscure. According to Festus, *buris*, the tail of the plough, was an Etruscan word. It may appear in 2 *pikoya buratu*, the extremity or bending of the ploughshare. The Basque verb *burdatu* means to bend, and from it *burdax*, an extremity, is supposed to be derived. Such a term must be astronomical, as the whole of the contents of the Templum appear to be.

With this arcane subject I close for the present my survey of the Etruscan inscriptions, which I have pursued with ever-increasing sympathy for the many and distinguished scholars who have read them by a totally different system, in view of the numerous apparent confirmations of their process, yet with ever-increasing confidence that by that process no light can be shed on Etruscan antiquities nor a solid basis be gained for a consistent reading of the documents themselves. Conscious of its many imperfections, I send this article forth from my study as a first essay in decipherment calling for the honest criticism and collaboration of scholars to whom truth is more than theory, rather than a decipherment itself of the documents with which it deals. Nor can I, in closing, forbear to express to one whose name occurs frequently in these pages, my sense of indebtedness for long hours stolen from the engagements of a busy life to add to my Etruscan material, to read with critical eye the results presented, and to furnish me with many valuable suggestions which cannot but be useful to the student of the new process.

ETRUSCAN VOCABULARY.

In this vocabulary, as in the first reading of the inscriptions in the text, I have given the same conventional phonetic values to the Etruscan characters. Thus I read A as *ra*, O as *ma*, S as *no*, E as *ne*, P as *tu*, &c. For the extent to which this conventional reading may be departed from I refer to the analysis of the syllabary, without a careful study of which this vocabulary cannot be understood.

1. A ra, Basque *ra*, to, towards.
2. A ra, Basque *ara*, interjection, behold.
3. A ra, Basque *ere*, also.
4. A ra, B. *erre*, to burn.

ABC, *raulchi*, B. *iraulsi*, to overthrow.

AC, *rachi*, B. *eritsi*, to esteem, judge.

1. ACE, rachine, B. *eritzen*, fuller infinitive form of the above ; *ne*, the postposition, to.

2. ACE rachine, *erezein* = B. *zein-ere*, however, but in Etruscan whosoever.

AD.AP artu, B. *artu*, to hold, take, receive, treat, lead.

APA artura, B. *ardura*, care.

APE artune, fuller infinitive form of AD.

APNO artukama, B. *artu* and *gomuta*, remembrance, to hold memory.

APNY artukaku, B. *artu* and *gogo*, mind, memory.

APNYLE artukakusane, B. *artu* and *gogatu*, *gogatzen*, to think, dream. In Etr. is a fuller form of the preceding.

AF arag, B. *irago*, to pass, ascend.

AFE aragan, fuller infinitive of AF.

1. AH, AN raka, B. *rako*, towards, for. Also A L.

2. AN raka, B. *rako*, as above, but in Etruscan employed as a verb and verbal adjective "to towards," "the towarding," thus meaning approach, offer, present, sympathize, join. As a noun it is the B. *erruki*, *urriki*, compassion, sympathy, regret.

1. ANE, ALE rakane, ragone, the infinitive form of AN.

1. ANA rakora, noun form of the same postposition, an offering or sympathizing.

ANCAD rakachiratu, B. *rako* or *erruki*, and *jardu*, *jardun*, to be occupied = paying attention to.

ANIA rakaura, B. *rako* and *arri*, *harri*, a stone = an offered stone.

2. ANA rakara, B. *erakarri*, cause to bring.

2. ANE rakane, B. *eragin*, cause to make.

ANL rakasa, B. *erakasi*, to teach, cause to learn.

ANM, ANS rakano, synonym of AN and ANA. 1.

AI rau, B. *arau*, rule, right.

AIY rauku, B. *araukide*, conformable, *arauka*, in proportion.

1. AIS, AIM rauno, B. *irion*, to send.

2. AIS rauno, B. *iraun*, continue, endure, persevere.

1. AL rasa, B. *eritsa* or *deritza*, 3 sing. pres. ind. of *eritsi*.

2. AL arsa, B. *urte*, *urthe*, year: Lesghian *reshin*, Circass. *tlaysee*, Georgian *tzelitzadi*.

AM, AS, rano, B. *rano*, synonym of A. 1.

ASY ranoku, Etruscan compound of *rano*, denoting a thing presented, an offering.

1. Am rami, B. *irrin*, *irritu*, split, crack, divide.

2. Am rami, B. *arrunt*, all without exception, whole ; Japanese *aramashi*.

AmA ramira, compound of *mira*, B. *miratu*, to see, and the causative *era* ; *eramira*, cause to see.

AmE ramine, compound of B. *imini*, to place, and the causative particle ; *erimini*, cause to place.

AO rama, B. *erama* or *darama*, 3 sing. pres. ind. of *eraman*, to bring; also stands for the following.

AOE ramane, B. *eraman*, to bring.

AV rapi, synonym of *artu*, agreeing in general meaning with B. *arrapatu*, to seize; *erpetu*, to claw; *irabazi*, to gain. It often means hold, take heed, behold!

AVP rapitu, B. *arraputu*, to seize: a fuller form of AV.

AVLE rapisane, B. *arrapatzen*, another form of the preceding.

AYA, ATA rakura, B. *irakurri*, to read.

AYE rakune, B. *ara* for *arau*, and *gune*, place, standing; like *ongune*, accord.

A/ˡ raba, B. *arreba*, sister of a brother.

1. B ul, B. *al*, *ahal*, power: in Etruscan often used as an adjective.
2. B ul, B. *ahalge*, shame.

BE ulne, B. *almen*, power, dominion.

BINO ulukama, B *al*, *auka*, *eman*, power, choice, to give: the Lucumo, or elected president of the Etruscan confederacy.

C che, B. *che*, even, self.

CA chira, B. *zeru*, heaven, sky.

2. CA chira, B. *ezarri*, to place, set.
3. CA chira, B. *jar*, attention; also used as a verb in Etruscan.

CAC chirachi, a verb formed from B. *jar*, E. *jarritze*, to pay attention.

CADE chiratune, B. *jardun*, to be occupied with or at.

CAE chirane, fuller verbal form of CA. 3, to pay attention.

CAL chirasa, E. 3. sing. pres. ind. of CAC, and a noun synonym of CA. 3.

1. CE chine, B. *zen*, defunct, late.
2. CE chine, B. *zeña*, who, which.
3. CE chine, B. *zein*, how.

CEI chineu, ? B. *ez*, not, and *nai*, *nahi*, wish = contemnu, contempt.

CELA chinegora, B. *chingar*, spark.

1. CI chiu, B. *sei*, six.
2. CI chiu, B. *chehe*, small.

CNL chikasa, from B. *zeken*, niggardly, parsimonious, by changing *en* to *esa*, *zekesa*, the niggard.

CLA chigora, B. *zigor*, a scourge.

CV chipi, B. *chipi*, little.

CVP chipitu, synonym of *chipi*, and used to denote a little one, a child.

CVNC chipikachi, an Etruscan word formed like *azpikache*, the B. *azpikoche*, even a slave. So chipikachi is: "even a child."

1. CL chisa, B. *zazu*, 2 pl. imperat. of *dut*, have ye, do ye have.
2. CL chisa, B. *chitsu*, to precede.
3. CL chisa, B. *izats*, a feather brush without handle.

CLE chisane, B. *etsitzen*, to esteem.

CLVY chisapiku, E. word composed of B. *etsitz* and *beko*, abbreviation of E. *begogo*, consideration, regard = appreciative regard.

CLAN chisa raka, B. *zazu erruki*, have compassion.

CLII chisata ? B. *sistatu*, pierce, or *ezeztatu*, annihilate.

C‡L chiichsa, ? B. *cioten*, they to him do, and imperative *za* = *ciotza*, let them to him.

1. D.P. tu, B. *da*, 3. sing. pres. ind. of *naiz*, he, she, it is.
2. D.P. tu, B. *du*, 3. sing, pres. ind. of *dut*, he, she, it does or has.
3. D.P. tu, B. *eta* of *etan*, *hetan*, &c., old 3. personal pronoun.

DAM, PAM, DAS, Turano, properly Turaan, Tyrrhenia.

1. PE tune, B. *den*, *dena*, who is, he who is.
2. PE tune, B. *duen*, if he has or does. In E. *duen* is categorical, he has or does.

PEY tuneku, B. *tanka*, *tankatu*, strike.

PI tuu, B. *dio*, he to him does.

PV tupi, an E. word meaning "instead of"; perhaps from B. *toki*, place, and *be*, under.

PY tuku, B. *toki*, a place.

II.I ta, perhaps B. *da*, he is : see D. 1.

IV tabe, B. *debe* of *debeku*, prohibition, *debekatu*, forbid.

1. E ne, B. *n*, *en*, sign of dative, to, at, in.
2. E ne, B. *ni*, I, *ene*, my.
3. E ne, B. *n*, *en*, with relative power, who, which.

1. EC nechi, B. *ansi*, care ; in E. more frequently a verb than a noun.
2. EC nechi, B. *neska*, girl, daughter.

ECN nechika, B. *anzeko*, like, similar.

ECV nechipi ? B. *nehabe*, servant, or *inyubi*, fond.

EPI netuu, E. *nituo*, answering to B. *diotet*, I to them do. See EI.

EN neka, B. *neke*, trouble, difficult ; in E. generally a verb, to be unable, fail, have difficulty.

ENA nekara, B. *negar*, *nigar*, tear ; in E. it is a verb without added *egin*.

ENE nekane, B. *negian*, I did.

EI neu, E. *nio*, answering to the B. *diot*, I to him do.

EIN neuka, B. *nayago*, to prefer.

EL nesa, from B. *ansi*, E. 3 sing. pres. ind. of verb, to care for, and noun, care.

ELI nesau, B. *nitzayo*, I to him am.

1. ES neno, B. *nion*, I to him did.
2. ES, EM neno, E. compound postposition, into, for.

EY neku, B. *nai*, *nahitu*, to wish.

E/\L nebasa, B. *nabusi*, master.

E/\LO nebasachi, E. *nabusitze*, to command.

1. F ag B. *age*, appearance ; in E. apparently, an interjection, behold !
2. F ag B. *agi* of *agin*, command, promise ; in E. 3. sing. pres. ind. of verb.
3. F ag B. *egi* of *egin*, to do ; in E. 3 sing. pres. ind. and imperat. of verb.
4. F ag B. *igo*, ascend ; in E. 3 sing. pres. ind. or imperat. of verb.

FA ager B. *ageri*, to appear, declaration ; in E. generally a verb, to manifest.

FAS ageran B. *agerrian*, discovered, exposed to view.

FAL agergo B. *ageriko*, verb *ageri*, with future suffix *go*.

FP agtu B. *egit* of *egin*, *egiten*, to do.

1. FE agen B. *agin*; see F. 2.

2. FE agen B *egin*: see F. 3.

FEP agentu B. *agindu*, fuller form of *agin*, command, promise.

FEL agensa B. *agintza*, promise, offering.

FELA agensara B. *agintzari*, chief, commander.

FNE agkane B. *igokian*, he ascended: in E. equivalent to *iragokian*, he passed.

FI *agu* B. *gai*, apt, capable: in E. means excellent.

FIA agura B. *jayera*, inclination, *jayeratu*, to incline: in E. used as postposition, meaning inclining to.

FIL agusa B. *hatzegin*, to scratch, with inversion *egihatz*: in E. means to write, also.

FIS aguno, composed of B. *age* = *agertu*, declare, and *on*, good: it may mean to show good omens.

1. FL agsa B. *so egin*, with inversion *egi so*, 3. sing. pres. ind. and imperat., to look.

2. FL agsa, formed of *agin*, to command, with contraction, and *sa*, the E. mark of agency: see 8EL, CNL. It is the equivalent of *agintzari*.

FY agku, E. compound of *age*, appearance, meaning as *ageko*, a declarer.

F38 agtala, B. *gatillu*, a cup, vase.

H. N ka, B. *ka*, postposition, by.

1. NA kara B. *ekarri*, to bring; *dakar*, he brings.

2. NA, NNA kara, kakara, E. words meaning a state: perhaps connected with B. *herri*, *erri*, a country.

NAC karachi, B. *ikherreste*, gratitude: compare AC. *eritsi*.

NAL karasa, B. *sortze*, the birth, *natus*, *nata*.

1. NE kane B. *egin*, to make: *kane* is an independent E. verb with the meaning of *egin*.

2. NE kane B. *gan*, postposition, in: in E. it generally means towards.

3. NE kane B. *kian*, *kion*, termination of the past tense of regular verbs: in E. denoting 3 sing., he did.

1. NEI kaneu from B. *gan* as represented by *ganatze*, to attract, is an E. verbal use of the postposition in the 3 sing. pres. ind., meaning, it is towards, *i.e*, it concerns, regards, presents.

2. NEI kaneu ? a combination of NE 3, with the pronominal I, as in LI *zayo*, PI *dio*, EI, *nio*, meaning, he to him did.

NEM kaneno B. *ganaino*, as far as: in E. seems simply to mean towards.

NEY, HEY kaneku B. *ganako*, towards, for: in E. means, that which is given towards, namely a sacrifice or offering.

1. NI kau B *kio*, termination of regular verbs, 3 sing. pres. ind., he does.

2. NI kau B. *kiko*, postposition, for.

NIY kauku ? B. *zahako*, besides, other, outside, beyond.

NL kasa B. *ikasi*, to learn, perhaps in 3 sing. pres. ind.

NV kapi B. *gabe*, postposition, without: in E. often used for the following.

NVD kapitu B. *gabetu*, to deprive, to be deprived.

NVN kapika B. *gabeak*, indigent, deprivation.

NY kaku B. *gogo*, mind, desire, memory.

NYI kakuu, E. dative or locative of *gogo*, answering to B. *gogoan*.

1. L go B. *go*, sign of genitive.

2. L go B. *go*, mark of future.

LI gou B. *goye*, conversation : in E. it means word, verbal message, intimation.

1. I u B. *au*, *hau*, this : sometimes in E. is personal or possessive rather than demonstrative.

2. I u B. *o* in *o-artu*, heed, attention : comp. Japanese *uya-mau*, to reverence, respect.

1. IA ura B. *aur*, child.

2. IA ura B. *oar*, imperat. of *oartu*, pay attention, take heed.

3. IA ura B. *hiri*, a city.

4. IA ura B. *harri*, *arri*, a stone.

IAP uratu ? B. *orde*, place.

IANYI urakakuu, compound of B. *oroitu*, remember, and *gogo*, in oblique case *gogoi*, meaning to keep in memory.

IAI urau B. *oroi* of *oroitu* ; see above.

IAL urasa, answering to B. *aurkeztu*, to present ; in E. is often a noun, denoting, homage or offering.

IC,K, uchi B. *hitz*, word.

1. IP utu B. *aita*, father.

2. IP utu B. *auta*, *hauta*, choice, to choose.

IPE utune E. *oaten* answering to B. *oartu* : see I.1 and IA.2.

IES uneno B. *hunen*, of this : see I.1.

IE8 unela B. *onela*, thus.

1. IN uka B. *ogei*, *ogoi*, 20.

2. IN uka B. *uga* in *ugatz*, breasts, mother's milk : E. for mother.

3. IN uka B. *ukha*, *ukatu*, to deny, refuse.

INE ukane B. *ukan*, to have, to be.

IL ugo, B. *uko*, refusal, denial.

1. IL usa, B. *atso*, old, now only said of women : in E. it means age, thus answering in meaning to the Basque *adin*.

2. IL usa, E. 3 sing. pres. ind. of B. *utzi*, to leave : read *utza*.

Im umi, B. *hume*, child.

1. IM, IS uno B. *on*, good : in E. also employed as a noun, goodness.

2. IM, IS uno B. *huni*, dative of *hau*, this.

ISAC unorachi B. *oneritsi*, to esteem, love.

ISAL unorasa, the 3. sing. pres. ind. of the above.

ISIS unouno, compound of *on*, good, and E. verb *oan*, *oaten*, to pay attention : see IPE. The verb *onoan* thus means, to pay kind attention.

ISL unosa B. *onetsi*, to esteem good, in 3. sing. pres. ind. : *onetsa*.

ISLE unosane B. *onetzen*, infinitive form of above.

ISLAN unosaraka, attributive form *onetsirik* not found in B. : beloved.

1. IV upi B. *obe*, better : in E. denotes a noble.
2. IV upi, sometimes used for IΛ.
3. IV upi B. *opa*, *opatu*, desire, to desire.
1. IVP upitu B. *opatu ;* see above.
2. IVD upitu B, *obeto*, better.
IVP8 upitula ? B. *obi-tille*, a title or inscription on a grave.
IVOI upimau for IΛOI, which see.
IΛ uba B. *obi*, *hobi*, the grave.
IΛOI ubamau B. *obi mai*, a grave-tablet.
1. K uchi B. *hitz*, word.
2. K uchi B. *utzi*, to leave.
KAΛ uchiraba ? *aiserreba*, a plaything.
1. L sa B. *so*, a look ; in E. also used as interjection, Behold !
2. L sa, abbreviation of E. ΛL, *basa*, and.
3. L sa B. *su*, fire.
1. LA sara E. three, in B. *hirur*.
2. LA sara, abbreviation of LAP *zarratu*, writing.
3. LA sara B. *sari*, reward, praise : used as noun and verb in E.
4. LA sara B. *zari*, a chief, commander.
LAP saratu, verbal form of B. *zarrapo*, scratching, meaning in E. to engrave, write : is employed as verb, noun and adjective, *zarratu*.
LAF saragi, fuller form of LA. 1.
LAFC saragichi, E. thrice.
LAV sarapi B. *zarrapo*, a synonym of LAP.
LC sachi, an E. verb formed of *so*, look, and the termination *tse* : *sotze* answers to the B. *so-egin*, to look.
LP satu B. *azti*, a diviner.
1. LE sane B. *zuen*, 3. sing. past ind. of *dut*, he had or did.
2. LE sane B. *zu en*, ye who.
3. LE sane B. *esan*, to say.
4. LE sane from B. *ez*, not ; E. *ezan*, refusal.
LEP sanetu B. *izandaite*, perhaps, in abbreviated form *izanda*.
LF saag B. *so egi*, look !
LN saka B. *so ka*, by the sight.
LI sau B. *zayo*, he to him is.
LM sano B. *asantatze*, build masonry.
LMC sanochi B. *asantze* = *asantatze* ; see above.
LO sama B. *asma*, an indication.
LOT, LOY samaku, E. adjective derived from *asma*, indicating.
LV sapi B. *azpi*, under, below.
LVP sapitu B. *kupida*, comparison.
LVNC sapikache B. *azpiko che*, servant even, even a servant.
LYA sakura ? B. *askor*, joyous : in E. it seems to denote pleasure.
m mi B. *imini*, *ipini*, to place : for fuller form see mE.
mA mira, B. *mira*, *miratu*, to see : in E. also denotes a sight, spectacle, admiration, and regard.

mAP miratu B. *miratu*, to see: in E. often means to show.
mAN miraka, compound of B. *mira*, to see, and *ka*, by.
mAL mirago, E. equivalent of B. *bortz*, five.
1. mE mine, B. *imini*, to place.
2. mE mine, B. *men*, power.
3. mE mine, B. *min*, grief.
mI miu, B. *mea*, *mehe*, small, thin.
mL misa, E. memorial, monument: in Lycian bilinguals = Gr. *mnema*.
mV mipi, E. verb, to send: derivation unknown.
mVD mipitu, fuller form of *mipi*.
mVL mipisa, E. a messenger, envoy: perhaps the original of "embassy, as *imbisa*. Compare the *sa* with that in 8EL, CNL, FL.
1. M.S no, B. genitive termination *en*.
2. M.S no, E. oblique cases of E *ni*, I, as: of me, to me, to my.
3. S no B. *no*, hold! behold! when speaking to a woman; when to a man, *to!*
4. S no B. *no*, verbal postpositive, until.
1. SA nora B. *anre*, *andre*, wife, lady.
2. SA nora B. *laur*, four.
3. SA nora B. *narri* of *narritatu*, incite, annoy.
1. SC,MC nochi for B. *aintzi* of *aintzindu*, to present, come before, warn.
2. SC nochi for B. *nau che*, he to me does even, or, he to myself does.
SCE.MCE nochine, B. *aintzin* of *aintzindu*: see SC.1.
SCI nochiu, E. verb, to desire or request: comp. Japanese *nozo-mu*.
MCLE nochisane, B. *aintzitzen*, same as *aintzindu* MC.1.
MPAN noturaka? B. *ondoreak*, descendants.
SPI notuu corresponds to B. *naute*, they me do.
1. SE none, B. *non* where: in E. has also relative power.
2. SE none, answers to B. *noiz*, in sense of: "times."
3. SE none, E. termination of genitive plural.
SEA nonera? E. nine.
MEC.SEC nonechi? E. seven.
SN noka B. *noku*, lack, defect: in E. is a verb, to lack, fail.
SL nogo B. *nagi*, idle.
SI nou, B. *nau*, he me does.
SINV noukapi B. *nau gabe*, he to me does deprivation.
1. ML nosa B. *aintzi*, see SC.1. In E. it is 3 sing. pres. ind. of the verb "to present before, to warn," and a noun meaning a "present," and perhaps "a predecessor."
2. ML nosa B. *nas*, together: also as ML or MLE it becomes in E. a verb, to be or do together, to unite.
SV.MV nopi B. *nabe* in *nabari*, to see from afar: Japanese *nobe-ru*, to stretch, extend. In E. it is a verb, to extend, put far away, and an adjective, far, extended, great.
MVP.SVP nopitu, fuller E. form of the verb *nabe*, extend.

MY.SY noku, B. *naga* of *nagatu*, to hate.

SYIE nokuune, B. *nuqueyen*, I should have had or done: in the only case in E. it is rather "would that I had."

S/\ noba, B. *nebia*, brother.

1. O ma B. *ema* of *eman*, to give: in E. is sometimes infinitive, at others marks the present indicative.

2. O ma, abbreviation of OI, which see.

1. OA mara, B. *marra*, limit, rule, line, stroke: in E. it denotes a monument, probably as *marking* or *defining* the place of sepulture.

2. OA mara B. *amar*, 10.

OANA marakara, compound of *marri* and *ekarri*, a monument, the mark brought.

OANIA marakaura B. *marka*, line, sign, and *harri*, stone, a signal stone or stone of indication.

OANY,OANL *marakaku*, *marakago*, E. compound of *marra* and *gogo*, meaning, a memorial, but the construction of which is not clear.

OAS marano, E. 10th, *amar*, with E. genitive particle *no*.

OPE matune, B. *ematen*, to give.

OII mata B. *emat* of *ematen*.

1. OE mane B. *eman*, to give.

2. OE mane for OL which see.

3. OE mane B. *amona*, mother.

OESA manenora B. *amandria*, lady mother.

OF8,OL8 *maagla*, *magola*, B. *makilla*, stick, staff, rod.

OI mai B. *mai*, *maki*, table: in E. means a space for an inscription, a tablet. Japanese *ma*, a space.

OL masa B. *emaitza*, a gift.

1. OV mapi E. two: B. two, *bi*.

2. OV mapi E. great; root of B. *ambat*, and original of *ain*.

OVA mapira E. eight.

OVP mapitu B. *ambat*, so much, how great.

OVL mapigo, E. twice; *go*, the genitive sign.

OVS mapino, synonym of preceding: *no*, genitive particle.

OV8 mapila, same as OVA.

O8ES molaneno, same as OAS, tenth.

1. V pi E. 3. sing. pres. ind. of *dut* or a similar auxiliary: now represented by 3. sing. imperat. *bu*. In E. *be*, he has or does.

2. V pi B. *be*, under.

VP pitu B. *epatu* fix a limit; in E. seems to mean, to set, set up, as a monument.

VPE pitune B. *epaten*, fuller infinitive form of above.

VFIL begiusa, a doubtful word. In E. VF is B. *begi*, eye, and *behatz*, consider, is VK or VIC: also IL represents B. *hatz* or *hatza*. If VFIL be a true E. word, IL must be a verbal form of *hatz* answering to B. *atzitu*, seize, take, in 3. sing. pres. ind. or imperat., *hatsa*; and the whole will mean, take eye, or behold!

VN pika? abbreviated form of B. *bakidatu*, to communicate.

VNE pikane, fuller infinitive form of above.

VNA pikara, B. *pikor*, a morsel: in E. a small contribution.

VNI pikau, in Cippus of Perusia takes the place of VNY in Eugubin Tables. VNY is formed of V *be*, under, and NY *gogo*, mind, and means regard, consideration; B. equivalent unknown.

VNL pikago, is the same as VNY, *begogo*, and is used as a verb, considering.

VL, VY pigo, piku, an E. word probably connected with B. *bekoki*, forehead, but meaning foremost person, *princeps*.

VI piu? V. 1, with pronominal increment, a synonym of *dio*, he to him does.

Vm pimi B. *bean*, below: B. changes final syllables in *m* to *n*. Originally the compound meant "placed under," *be* and *imi*.

VmIC pimiuchi, composed of B. *bean*, placed under, and *oyeche*, better *oyechek*, these even, the whole, meaning "these subjects."

VS pino, B. *banu*, if I had or did: in E. categorical, I had or did.

VO pima, E. one, B. *bat*.

VYE sometimes VNE, pikune, pikane, equivalent of B. *bakar*, alone, only.

Y ku, B. *gu*, we.

1. YA kura, B. *gu ra*, us towards.
2. YA kura, B. *gure*, desirous, *gura*, desire.
3. YA kura, B. *gur*, reverence, salutation.

YP kutu, B. *ekit* of *ekiten*, undertake, attack, begin, advance.

YPE kutune, B. *ekiten*, see above.

YPI kutuu, B. *gede*, *chede*, boundary, end, resolve: used in E. for *chedatu*, limit, define.

YPVY kutupiku, B. *chistmista*, lightning.

1. YE kune B. *gu ri*, to us: E. uses dative and locative *ne* after *gu*.
2. YE kune B. *gune*, place, position, standing, moment, accord.

YN kuka B. *egoki*, to concern, regard, belong to: also as adj. suitable, fit.

YNI kukau B. *dagokio*, 3 sing. pres. ind. of *egoki*.

YI kuu B. *koi*, *khoi*, desirous: in E. is verb, adjective and noun, to desire, desirous, desire.

YIYI kuukuu, E. superlative of reduplication, like B. *onona*, *handihandia*, very desirous, most desirous. It is also used for beloved or dearly beloved.

1. YL kusa, B. *ikusi*, to see; in E. may represent as *ikusa*, 3 sing. pres. ind.
2. YL kusa, probably original of B. *eguzki*, the sun.

YLA kusara, inverted form of *B. era-kusi*, cause to see, show.

YV kupi, B. *jabe*, lord, master.

YVP kupitu, B. *jabetu*, to command, lord it, possess.

8A lara, B. *lur*, earth.

8ANV larakapi, E. word compounded with B. *gabe*, without. It means permission, or without objection.

8AL larasa, B. *lurrez*, pertaining to the earth; in E. = a grave.

8ALMYI laras-anokuu, compound of *lurrezno* = B. *lurrezko*, of earth, and *koya*, a lost word for chamber, receptacle. The whole denotes a tumulus or earthen mound.

8ASYI.8ASY, laranokuu, laranoku, other forms of the above.

8AYE laragune, B. *alargun*, a widow or widower.

8P latu B. *lot*, *lotu*, to bind: in E. also denotes husband or wife, a consort.

8E lane B. *lan*, work : in E. also takes place of *landu*, to work.

8EL lanesa B. *langille*, a workman ; for the formation of the E. word, see OVL, FL, CNL. In E. *sa* marks the agent.

8FI alegiu B. *alegin*, what is possible : in E. *alegio*.

1. 8V alpi B. *alaba*, daughter.

2. 8V alpi B. *albo*, side ; in E. also takes place of B. *alboratu*, to side with, approach.

8VL alpisa B. *alabichi*, god-daughter ; in E. little daughter ?

8VO alpima, fuller form of VO, *pimo*, one, B. *bat*.

1 ba, B. *ba*, if.

/1A bara, B. *para*, *paratu*, to place.

/1AN baraka, B. *berek*, his, her, its.

/1AYD barakutu, B. *borrokatu*, to wrestle, contend: in E. it means to fight.

/1ATRA barakutura, compound of *borrokatu* and *tar*, a fighter, warrior.

/1A/1A barabara, B. *barbar*, a confused speaker, foreigner, barbarian.

/1A/1AN barabaraka, compound of B. *barre*, *farre*, laughing, smiling: E. *barrebarrek*, the laughing.

/1P batu, E. army ; lost in B., yet the root may appear in *bota*, to hurl, in *fatzea* of *farfatzea*, to fight, etc. This is the Japanese *butsu*, to fight, strike, whence *bushi*, a soldier.

/1E bane, E. to join ; also means, united, and union. Is same as B. *batu*.

/1ED banetu, fuller form of above.

/1EL banesa, B. *banaiz*, if I am: in E. it is categorical, I am.

/1EYP banekutu, perhaps the equivalent of B. *bakidatu*, to communicate.

1. /1I bau, B. *bahi*, a pledge, engagement: in E. also means a consort.

2. /1I bau, B. *bai*, a spot, stain.

/1L basa, E. and ; perhaps B. *baita*, also.

/1LA basara, B. *fetcho*, pretty, dear, with increment.

/1LAN basaraka, form of above, *fetchorik*.

/1LE basane, ? B. *epaitzen*, to cut.

/1M bano, E. within ; ? B. *barruan*.

/1V bapi, B. *paba*, a support, aid : in E. is also a word for father.

/1VIA bapiura, ? *pabe aurre*, forefather or grandfather: from B. *aurre*, before, which makes *aurrekoak*, ancestors.

/1‡A baichra, E. name for a multiplication table.

‡ itch, ich, ? E. verb, to thank.

‡AN itchraka, compound of B. *itcheki*, hold, adhere to, and *rik*, adhering to.

‡DI itchtuu, B. *itsatu*, to hold to, used as a noun, the adherent, in the dative plural : plurality unexpressed, dative by final *i*, *itsatui*.

‡E itchne, B. *etsai*, an enemy, converted by final *n* into an E. verb, to be inimical, *etsain*.

‡EP itchnetu, comp. B. *etsaintasun*, enmity : in E. *etsainta* is an adjective, inimical.

‡NA itchkara, compound of B. *itcheki*, hold to : *itchekiri*, adhering.

‡NAL itchkarasa, the same with mark of agency : *itchekirisa*, the adherent. See 8EL, &c.

‡I itchu, B. *etsai*, enemy.

‡L itchsa, B. *itsas* in *itsaskor*, adhering.

‡M itchno, another form of ‡E : the final E and an added E *ne*, to, may constitute the longer M.

‡V itchpi, B. *ichpi*, a morsel : in E. a contribution.

‡VCI itchpichio, B. *ichpicho*, a wager, bet : but in E. same as *ichpi*.

ETRUSCAN PROPER NAMES.

Masculine.

Those of which the sex is doubtful are indicated by a mark of interrogation. Basque names of persons and places are generally significant ; so apparently were the Etruscan.

AP. Artu, a Celtic name ; in Eugub. Tables, Hertei is king of Umbria.

APY, Artuku, perhaps, Wredech, Feredech, a Pictish name.

APYCE, Artukuchine.

ARR, Artutu.

APMN, Artunoka ; comp. Pict. Gairtnoch.

AEL, Arnesa, called Folnius in Latin ; perhaps in E. Arnias.

ANA or ANAIN, Rakara or Rakarauka.

AN OAPE, Arka Maratune.

ALNI, Arsakau.

AOVNI, Ramapikau : comp. Ralapika, Rabapika, Laturapika, Artupika.

A8V, Ralapi.

A8VN, Ralapika.

A/ΛVN, Rabapika ; compare Pict. Erp.

? CAP, Chiratu.

CAPCV, Chiratuchipi.

CAPNA, Chiratukara.

CANA, Chirakara.

CAN‡NA, Chirakaitchkara, Latin Caesius, hence Zerukoitchekiri.

? CAL, Chirasa.

CALE, Chirasane.

CALEI, Chirasaneu.

CAVLI, Chirapisau, translated Caulias, hence Zerbazuha in E.

? CAY, Chiraku.

CPAC, Chiturachi.

CEICNA, Chineuchikara ; comp. Pict. Cineoch. Perhaps Sinhetagarri.
? CELA, Chinesara.
CFENLE, Chiagnekasane may be Cecinna, Sisenna.
CFS‡I, Chiagnoitchu, translated Saturninus.
CNA, Chikara.
CNV, Chikapi.
CICV, Chiuchipi.
CINA, Chiukara.
CL, Chisa, translated Cassius, probably Chisa in E.
CSY, Chinoku.
COMLN, Chimanosaka.
CV, Chipi, translated Sentius, probably Sepe in E.
C/ɩ, Chiba.
PY, Tuku, translated Tullius, hence Tuku or Idoki in E.
ERN, Netuka, probably Entuka.
. FA, Ager, translated Scaevius, probably Ager in E.
FAN, Agerka, translated Scae Calis, probably Agerka in E.
FELImN, Aginsaumika, translated Volumnius, hence Eginezaumik in E.
FELOVPNA, Aginsamapitukara.
? FESI, Aginnou.
FESCV, Aginnochipi.
FEYE, Agingune.
FIACI, Agurachiu.
FISCV, Agiunochipi.
? NALE, Karasane.
NVFI, Kapiagu. translated Alfius, hence Kofegio in E.
N‡, Kaitch, translated Caius, probably Caitch in E. : comp. Pict. Cait.
LImOm, Goumimami.
? ICIA, Uchiura.
ILE, Usane, translated Vensius, probably Usena in E.: Osin, a Japanese name.
? LAS, Sarano.
LAV, Sarapi, translated Spedius, hence Zarrabe in E.
LAVYN, Sarapikuka.
? LAY, Saraku.
LECNE, Sanechikane, translated Licinius, hence Zuntzegin in E.
LIC, Sauchi.
LSV, Sanopi.
? mAPC, Miratuchi : comp. Pict. Muirethach.
? SFN, Noagka.
MVN, Nopika.
SVD, Nopitu.
SV/ɩNI, Nopibakau.
OA, Mara, translated Niger, hence Mairu in E. As Mairubaita, comp. Pict. Morbet.
? OPA, Matura.

? OEP, Manetu: comp. Pict. Moneth or Munait.
OVES, Mapineno.
? OVI, Mapio.
? OVMV, Mapinopi.
OYANI, Makurakau: comp. Pict. Maicerce.
VCL, Pichisa, translated Phisius, probably Pisias in E.
VNAYA, Pikarakura, translated Otacilius Rufus, hence Bekarri Gorri in E.
? VKAL, Piuchirasa.
VLN, Pisaka, translated Fuscus, hence probably Pesca in E.
YAD, Kuratu: comp. Pict. Cruidne.
? YAN, Kuraka: comp. Pict. Kirkui.
YAYNA, Kurakukara.
YEYI, Kunekuu.
YNA, Kukara.
YIYI, Kuukuu, translated Titius, hence Koikoi in E.
YIS, Kuuno.
YR, Kutu: comp. Pict. Get and Gede.
YLA, Kusara.
YVD, Kupitu is Cupid.
YVO, Kupima.
8PAVN, Laturapika.
8PB, Latuul, translated Atius or Fatius.
ΛPΛ, Batuba.
ΛVΛ, Bapiba, translated Violens; comp. Pictish Fivaid, Latin Fabius.

Feminine.

APVN, Artupika, translated Tiitia.
AL, Argo.
AVL, Arpisa.
AVLA, Arpisara.
AYIV, Arkuupi.
AYVS, Arkupino.
AΛO, Arbama.
CA, Chira is probably Zeru.
CAI, Chirau, translated Cainnia, hence Zerua in E.
CAVΛ, Chirapiba.
CA8AY, Chiralaraku, translated Cafatia, hence Zerulurrekoi in E.
CA8AYI, Chiralarakuu, same name.
CPE, Chitune.
CEFL, Chineagsa.
CEIC, Chineuchi.
CVS, Chipino.
FAP, Agertu, translated Varia.
FPAV, Agturapi, translated Bassa.
? FES, Aginno.
F1LI, Agusau, translated Sentia, hence Egihatzau in E.

FI/ˡl, Agubau.
FVISI, Agpiunou.
FVSI, Agpinou.
NAL, HAL, Karasa, translated Aria, perhaps Egurasa in E.
NI, Kau, perhaps Caia.
HON, Kamaka.
LAF, Saraag, translated Lauci, probably Saregi in E.
LEITE, Saneukune.
LIA, Saura.
mAPCI, Miratuchiu.
? mAPIC, Miratuuchi.
mEOL, Minemasa.
mIYPA, Miukutura.
SAD, Noratu, probably Nortia.
MAY, Noraku.
SCIVN, Nochiupika.
SCY, Nochiku.
MII, Nota, Latin Gnata, hence Nata in E.
SVSI, Nopinou.
SYVM, Nokupino.
OVI, Mapiu.
VP, Pitu.
VL, Pisa.
YF, Kuag, translated Arria, perhaps Goegi in E.
YIN, Kuuka.
YIYE, Kuukune.
YIYI, Kuukuu, probably Koikoi.
8ANAC, Larakarachi.
8PEΩ, Latuneba.
ΩAP, Baratu, translated Varia.
ΩADC, Baratuchi.
/ˡIP, Bautu.

Names of Divinities.

CA, Chira, Zeru, Coelum.
YINA, Kuukara, Goikara.
YINM, Kuukano, Goijaun.
YVD, Kupitu, Cupido.
8EP, Lanetu, Hercules.
‡VN, Itchpika, Istapeko, Venus.

Names of Places.

AL8, Rasala, Rusellae.
AO, Rama, Roma.
? CAI, Chirau.
CALIS, Chirasauno.

CE, Chine, Sena.
CESY, Chinenoku, of Sena.
MVP, Nopitu, ? Nepete.
OAL, Marasa.
VL, Pisa.
YEFAY, Kuneagerku.
YVSNVY, Kupinokapiku.
YVY, Kupiku.

Within the comparatively small compass of this paper, NAL, *sortze* appears 30 times, IA, *aur* 20, NA, *andre* 26, and IN, *uga* 9. The verb LAD, *zarratu*, alone or in composition with OI *mai*, appears about 50 times, AP *artu*, 33, NEI *ganio*, 31, AL *eritza*, 35, NA *ekarri*, 27. The word FEL, *aginza*, exclusive of its appearance in proper names, occurs 30 times; NY, *gogo*, occurs 20 times, and NO, *gomu*, 15. OA, *marra*, appears in *marakara* 11 times and as often in other connections. The word IL, *atso*, occurs 13 times, the postposition AS, *rano*, 15, and the adverb or relative SE, *non*, 18. These sixteen fairly determined Basque words thus represent about 400 of the words presented in the inscriptions here set forth, and make the reading of Etruscan a simple matter.

ADDENDA.

The following, extracted from Deecke and compared with the copies in Fabretti's three supplements and Gamurrini's Appendix, have just been sent me by Mr. VanderSmissen. The first number is Deecke's; F. 1, F. 2, F. 3, denote respectively the three supplements of Fabretti; and A. marks the Appendix.

Lat.—A · FABI · IVCNVS
4. F. 3, No. 105. *Etr.*—AV 8A/ILAPOIAL
arpi larabausaratumaurasa
arue ilhar abo zarratu mai eritsa
behold Bean prop written tablet esteems

The Basque *ilhar* translates the French *haricot.* The Etruscan shows that the medial *h* is no part of the original word. The only term in modern Basque that approaches the form of the Etruscan *bai* and the meaning of the Latin *juncus*, which I suppose is what the scribe meant by *jucnus*, is *abe*, a prop, stay, tree. This must surely be the original Jack of the Bean-stalk, whom I had not expected to have the pleasure of meeting among the graveyards of Etruria.

5. A. 401, Tav. VI. *Lat.*—AR · TRIIBI · HISTRO
Etr.—AO · YPE/\I · OANA · SA
rama kutunebau marakara anre
erama Kutunebai Marakara andre
it bears Kutunebai Marakara's wife

What the sculptor meant by Kutunebai as Triibis I cannot imagine. The Etr. *kutune* answers generally to the Basque *ekiten*, to undertake; hence *bahı ekiten* would mean to undertake a pledge, or to engage oneself. The name Marakara is identical in form with the term commonly designating a memorial. Here, however, it translates Histro, itself an Etruscan word. The B. *arrokeria* means boasting, romancing, rodomontade; *marraka*, which seems to connect with it, means any strange noise, such as mewing, bellowing, bleating. The element *mara* appears, a little altered in form, in *churimuri*, *zurumuru*, a vague rumour, the final *muru* denoting the noise or sound. The modern B. word for the poet or improviser is *koblakari*, *kobla* being a Provençal term meaning strophe or stanza. He is thus a stanza-bearer; and the *mara*, *marra* or *murukari* must have been the bearer of strange or inflated sounds, the actor.

8. A. 719, Tav. VIII. *Lat.*—L · SCARPVS · SCARPIAE · L · TVcIPA
Etr.—LAPNO · SCAP/\P · LAVYNI

In the Etr. the /\P of SCAP/\P are peculiar in form, the /\ being rounded at the top and the P having a lower horizontal limb, making it appear like a combination of P and L. Also final YNI are indistinct.

zaratu kama · nochiratubatu · sarapikukau
zarratu gomu no jarri du Batu Sarapi egokio
written memorial which present does Batu Sarapi concerns

The name Scarpus is the Basque Sarapi, probably pronounced Sharpi. That most unclassical word Tucipa translates Batu, the common Etr. word for an army, which I have already shewn the relation of to the Jap. *butsu*, to fight and *bushi*, a soldier. It must, therefore, be a barbarous derivation from the Greek *teuchea*, answering to *teuchophoros*, an armed man.

9. A. 774, Tav. IX., is on a seal. The first line, supposed to be Latin, is, in the original, written from right to left: the second, from left to right. The initial letter of the first line is obscure, and so are the two in the second, which I have treated as Y or T.

/ˡEL · ΛAX
REL · TETII
banesa para ku banaiz parago
tunesa · kunekuda duenza gune gudu

"I will be placed for who does to us fight;" which I suppose means "I am at the disposition of any one who wishes to attack us." It is thus probably an armorial motto. The Etr. equivalent of the B. *naiz*, namely *banaiz*, is now well known. The verb *para*, *paratu* to place, extend, is in the future with the suffix *go*. The compound *duenza* consists of *duen*, who does or has, and *z*, the postposition. In the Eugubine Tables YII denotes the modern *gudu*, a fight, in distinction from YP, now *ekit*, undertake. In Etr. *guda* or *gudu* is a verbal form. There is no Latin in the inscription.

15. *Lat.*—C · ANNIVS · L · F · COELIA · GNAT
Etr.—FEL · ANNE · CV/ˡSNAL
aginza rakakane chipibanokarasa
aginza Erkaka ne Chipibano sortze
offering Erkaka to Chipibano *natus*

The name Annius must stand for Annulus. The B. for ring is *erhaztun*, from *erhi*, the finger. Finger-tip is *erkain*. The Jap. *kake*, to hang, hook, put on, &c., which makes *kake-gane*, a ring and staple for fastening a door, agrees with the B. *kako*, translated by the French *crochet*. I suppose, therefore, an old B. or Etr. word *erkaka*, a finger ring. The translation of Coelia by Chipibano I cannot explain. Were the second character A instead of V, some sense might be made of *zerubano*.

17. *Lat.*—C · ARRIVS · C · F · Q
Etr.—AO · APNYNI · VMPANAL
rama artukakukau pimiturakarasa
erama Artukakukai Bemitura sortze
it bears Artukaku Kai Bemitura *natus*

Artukaku, or in modern B. *artugogo*, means, to hold the memory, and is a common formula in sepulchral inscriptions. Here it is a proper name. It may have been used technically to denote the *arrha* or earnest money which kept the seller in mind of the bargain with the intending purchaser. The final Kai is, I think, an Etr. form of Caius.

18. *Lat.*—C · ARRI · ARN · ARRIA · NAT
Etr.—APN · APNYNI · APPI
APNYNAL
artuka artukakukau artu tuu
artukaku karasa
artuka Artukaku Kai artu dio
Artukaku sortze
receptacle Artugogo Kai receive it him does
Artugogo *natus*

Here, I think, the playful fancy of the Etruscan scribe has disported itself in heaping up *artu's*. The only doubtful word is *artuka*, literally, by holding, which I read receptacle, that which contains.

22. F. 8, No. 101. *Lat.*—Q · SCRIBONIVS · C · F
Etr.- FL · ‡ICV
ag sa ich u chi pi
egi so Ichauspe
behold Ichauspe

The exclamation or imperative would now read *so egi*. Ichauspe is a very Basque looking word, but I do not know how it translates Scribonius. To shut, enclose or hold, is *ich*, and ICV may be *hitz be*, under word, or *ospe*, sound, fame, renown. The compound is not in any Basque lexicon known to me. The Basque has lost its original words denoting writing, and letters generally.

Three other Scribonius inscriptions were found in company with the above, one in Latin and two in Etruscan.

F. 3, No. 102. A · SCRIBON
C · F
F. 3, No. 99. FL · ‡ICV · VL · mVYVAL
F. 3, No. 100. FL · ‡ICV · FL · mVY
egi so ichauspe pisa mipikupirasa
egi so ichauspe egiso mipiku

A comparison of the two latter leads me to regard Mipi, Mebe as a local name, answering in a measure to Meva in Mevania. Thus I read No. 99:

egi so Ichauspe Pisa Mebe jabe eritsa
behold Ichauspe: Pisa Mebe's lord esteems

Pisa is a woman's name, and may be the widow of Ichauspe. I read No. 100:

egi so Ichauspe egi so Mebego
behold Ichauspe behold Mebe of

The genitive Mebego will be equivalent to "a native of Mebe."

27. A. No. 402, Tav. VI. L · ΛFPNI · L · 8
L · ΛVRNI · L · F

The upper line is written in the original from right to left. The F of the second group is archaic, as are the L and 8 which constitute the third and fourth groups. The L is of the same form as that which appears in the *azti* of Atius, the haruspex (page 213). If the lower line be Latin it affords an argument in favour of the present reading of Etruscan. Translating it tentatively as Etruscan, I make:

zu abegi Tukau azi Al
sa babe Tukau so egi
"you welcomes Tukau's progeny Alsa; father Tukau behold."

The B. noun *abegi*, welcome, I treat as an Etr. verb. In B. *azi* means seed, and also to nourish, train, bring up: hence it may be an old word for *aur*, child, or *seme*, son. The separation of the word Alsa into two parts is not without parallel, but tells against the translation given.

26. 8EDINA
MLABRI

These two lines, the first of which I have inverted, are found on different sides of an amphora. Neither can be Latin. They may read:

lanetu Ukara
Nosara ahal dio
"The Lanth Ukara—he governs Nuceria."

The word *lanetu* I have already referred to as an officer in the Etruscan confederacy frequently mentioned in the Eugubine Tables. The noun *al*, *ahal*, power, here conjugated with *dut* in its compound pronominal form, must be a verb meaning to exercise power, to govern. Nuceria, however, is a city name belonging to Campania, Umbria and Cisalpine Gaul.

27. A. No. 754, Tav. VIII. OA · FENI · LA
SIITRA

The upper line of this also was written from right to left. The T of the lower line is in the original a compound character, a semicircle above the base giving it the appearance of a tripod. I suppose it, therefore, to be composed of ⊥ and Y and to represent *gogo*.

mara · Aginkau · Sara
no di gogotu ra
memorial Aginkai Sorano from to remember

Here again a proper name is separated by the lines. The inscription was found between Bolsena, the ancient Vulsinii, and Sorano, which is not mentioned by the classical geographers. The postposition *di* or *dik* from, by, after, out of, is well represented by II, the first element in *debe*.

29. A. 954. LO . . . . CINAE · B
LO . . . . C · IVPIC ·
AO . . . . AM · COIFCE
A . . . . EREITO . QVES
ƆVAME

I do not think it possible to make Latin of the right or perfect side. Of the mutilated left, *asma*, *asma*, *erama*, *ra*, give no connected sense. The right reads in Etruscan:

chiukarane · ahal
chi · upituuchi ·
rano · chimauagchine
netuneukuma · mipineno
chipiranone

I read Q as *mi* and the inverted C as if it were not inverted:

Chiukarane · al	Chiukarane · poten-
tzu · obeto hitz ·	-tate · best word ·
rano . seme au Agizen	towards · son Agizen
entun uko ema · imbe nion	to obey refusal giving · send I him did
chipi ranone	the youth to reconcile

Chiukarane is evidently the name of a place. It can hardly denote Clusium, where the bronze plate containing the inscription was found. The following *alchi*, *altsi*, analogous in form to the B. *altsu*, powerful, I suppose to be an Etr. noun, the power-holder or potentate, governing Chiukarane in the genitive of position. Literally *obeto hitz rano* means "towards the better word." It is probably a polite acknowledgment, answering to the hackneyed "your esteemed favour" of the English letter-writer. The following *seme*, in Etr. *sema*, denotes a son, and *au*, this, appears to have possessive value, his son. His name Agizen or Agizene may relate to *agitz*, vigorous. The B. *entzun*, to hear, obey, is *entu*, *entun* in Etr., and is of common occurrence in the Eugubine Tables. The other words, *uko* and *ema*, have already occurred. I regard Q as the equivalent of O with a perpendicular line from the base, employed as m, just as O with a dot in the centre is in Celtiberian. The verb *ranone* appears in the Eug. Tab. with the meaning, surrender, come to, take part with. It is a verbal form of *rano*, the postposition " towards."

F. 726. 8ASYI · YLESNEI · LAYINIAL
CENCVNIA

The upper line, written from right to left, is found upon the lid of an urn, and the lower, as given, upon the urn itself.

laranokuu · kusanenokaneu · sarakuukaurasa
chinekachipikaura
lurreno koya Kusaneno ganio Saraku uga au eritsa
zen Kachipika aur
earthen receptacle Kusaneno concerns Saraku mother his esteems
late Kachipika's child.

A. 41, Tav. II., is the inscription on a cup :

MIVNEI · AM

The first character is not M, but one repeating the upper angle of this letter, and wanting the final perpendicular. I find it with I, taking the place of OI, *mai*, in Lanzi, Saggio, No. 322 :

MIADNO mai artu gomu
No. 323. MILAPVM mai zarratu pino

I therefore read the inscription :

mai Pikaneu rano
inscription Pikaneu towards

The most interesting of these inscriptions from a philological point of view is the first (4. F. 3, No. 105). The Etr. and B. *ilar*, which translates the Latin *faba*, is the root of *illargi*, the B. word for the moon. The connection may have arisen out of the shape of the bean, or from a belief in the fable reported by Pliny (H. N. XVIII., 30), that the bean is the only grain that swells with the waxing moon. In the Hittite and Aztec hieroglyphic systems the bean has a place.

In the former its phonetic value is *ha*, constituting the first syllable in the word Hamath (Hittite Inscription, H. V., line 2). In the latter it has the values *e*, *eu*, bean being *etl* in Aztec. The Aztec hieroglyphic for *atl*, water, takes the place of the bean in the Hittite H. V., line 3, showing that *ha* was the original power of both symbols. Pliny (*loc. cit.*) speaks of religious practices connected with the bean among the Romans. It was regarded as impure by the Egyptian priests (Herodot. II. 37, Diod. Sic. I. 89), and by the Pythagoreans (Diog. Laert. VIII., 19, 21), who are supposed to have derived their lore from Egypt. The reasons for the aversion of the Egyptians and the regard of the Romans for this vegetable are historical. The lunar and bean name *ilar* or *hilar* was a tribal one, denoting a Hittite family, the Alarodians of Herodotus and the Allurians of the Assyrian monuments who dwelt in Armenia, the Illyrians opposite Italy, the Ilergetes and Ilercaones of Spain, and the Silures of Britain. Iluro, now Oléron, north of the Pyrenees, represents the same word. It was connected by the classical geographers with Lapurdum, whence the Basque Lapurta or the Labourd, just as Illyria connects with Liburnia, and Allapur with Alluria. So also Etruria furnishes Solaria and Portus Liburni, and in Liguria we find Ad Solaria and Libarna. When the Lupercalia were instituted at Rome, two families were appointed to preside over them, the Quintiliani and the Fabiani (Festus, 87). The latter, like the Fabii, were doubtless Etruscan Ilars, who understood the rites of the old Accadian Lubara, god of pestilence, and worshipped him under the twin names Lupercus and Februus. For the connection of this ancient deity with Jupiter Labradeus of Caria and the Irish royal hero Labradh Loingseach, see my essay on Monumental Evidence of an Iberian population of the British Islands, in Trans. Celtic Society of Montreal, Vol. I.

SEVENTEENTH ORDINARY MEETING.

The Seventeenth Ordinary Meeting of the Session 1884-'85, was held on Saturday, March 7th, 1885, the President in the Chair.

The minutes of last meeting were read and confirmed.

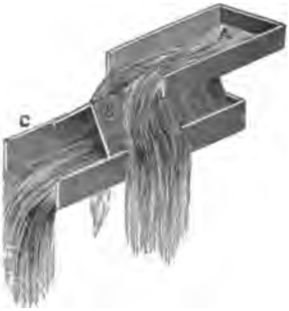
The following list of donations and exchanges was read :

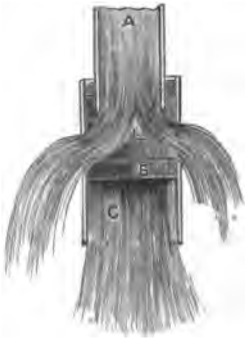
1. Transactions of the Manitoba Historical and Scientific Society, Nos. 12—18, Annual Report for 1884-5.
2. Canadian Practitioner, Vol. X., No. 3, March, 1885.
3. Science, Vol. V., No. 108, February 27, 1885.
4. American Journal of Science, March, 1885.
5. Monthly Notices of the Royal Astronomical Society, Vol. XLV., No. 3, January, 1885.
6. Journal of the Royal Microscopical Society, Series II., Vol. V., Part 1, February, 1885.
7. Bulletin de la Société Géologique de France, 3e Série, Tome XIII., 1885, No. 1.

Mr. T. H. Lennox was elected a member.

Mr. Charles Levey read a paper on "Gold Mining on the Saskatchewan," of which the following is an abstract :

The gold fields referred to are at and near Edmonton, on the North Saskatchewan River, N. W. T., Canada. The deposit, through which the present river cuts, is said to extend some sixty miles east and west. The northern and southern limits are not known. The thickness of the deposit is partly seen by the height of the river banks which, at the point referred to, are at least two hundred feet high. At the highest points, on some of these banks, gold can be washed out, but the quantity per cubic yard of dirt increases as we near the present water level. On the gravel bars the yield by hand working is about $1.60 per cubic yard. The gold is in the shape of very fine dust and minute nuggets. The largest of these nuggets is not larger than the smallest mustard seed. The hand-mode of separating the gold from the dirt will be understood by reference to the sketches in which A is the Dump Box, B the Grisley, and C the Blanket Box. The Dump Box is filled with gravel, after which water is dashed upon it by the aid of a long handled dipper. This washes the gravel from A to B. The coarse parts fall on either side of the double-inclined grate, while the finer parts fall through the grates on to the blankets in the box C; all but the black sand and the gold are discharged. The latter adheres to the blankets. The Dump Box is filled and emptied repeatedly for say ten hours, after which the blanket is washed in an ordinary tub, to the bottom of which the gold and black sand fall. The water is next poured off, and two or three charges of fresh water are poured into and out of the tub in order to further cleanse the gold and black sand. When these are sufficiently clean, they are removed from the tub to the gold pan. This is done by tipping the tub over the pan, and then by dashing water from the pan into the tub. The gold cannot be successfully removed from the tub in any other way. The pan is now held under water and shaken until the mass it contains is much reduced in bulk, by the separation of the lighter portions of the sand. Some quicksilver is poured in, together with clean water, and the pan is shaken until the quick silver has taken up all the gold. It is then again placed under water, and violently shaken to remove all the black sand. The remaining contents are then poured into a wash-leather which has been previously wetted and stretched. The edges of the leather are secured in the right hand, when the centre of it assumes the shape of a pounce. The neck of this is wrung until all the free quicksilver is squeezed through the pores of the leather, and falls in fine beads into the pan placed for its reception. When opened the bag is found to contain a ball of amalgam of silver colour and of about the consistency of putty. This is moulded in the fingers to the required shape, and then placed upon an iron shovel.





Heat is applied beneath the shovel to drive off the quicksilver that could not be removed by pressure. After a sufficient application of heat, the button of amalgam assumes a gold colour and is allowed to cool. This is the gold amalgam of commerce.

The rest of the paper was descriptive of the machine methods of recovering the gold.

In answer to questions from Messrs. Murray, Miles, Bain, Livingston and others, Mr. Levey said that hand-work had been going on for nine years, and machinery work five years; the first was not commonly satisfactory, and the other produced about $6 per day; that the tract was 200 miles north of Calgary, and extended 50 miles; that the yield per pan was about two cents; that the sand contained magnetic iron and a little platinum; that there were from 1,500 to 2,000 settlers; that there were large boulders of gneiss and granite which, he thought, came from the Laurentian to the north-east; and he thought hydraulic mining would pay after a very large expenditure.

EIGHTEENTH ORDINARY MEETING.

The Eighteenth Ordinary Meeting was held on Saturday, 14th March, 1885, the President in the Chair.

The minutes of last meeting were read and confirmed.

The following list of donations and exchanges was read:

1. "Some Historical Names of Places of the Canadian North-west." By Charles N. Bell, Esq.
   "Our Northern Waters." By the same. Presented by the Author.
2. Science, Vol. V., No. 109, March 6th, 1885.
3. Journal of the Franklin Institute, March, 1885.
4. Essex Institute, Historical Collections, Vol. XXI., Nos. 4, 5, 6, April, May and June, 1884.
5. The Pennsylvania Magazine of History and Biography, No. 32. Vol. VIII., No. 4, December, 1884.
6. Trübner's American, European, and Oriental Literary Record, Nos. 205–206.
7. Annual Report and Proceedings of the Belfast Naturalists' Field Club, 1883-84, Series II., Vol. II., Part IV.
8. Journal of the Tuckett Microscopical Club, Series II., Vol. II., No. 11 March, 1885.

9. **Journal of the Asiatic Society of Bengal, Vol. LII., Part II., 1883. Proceedings of the Asiatic Society of Bengal, No. X., November, 1884.**
10. **Verhandlungen der Gesellschaft für Erdkunde zu Berlin, Band XI., Nos. 6–10, Sitzungen vom 7 Juni, bis 29 November, 1884.**

Mr. A. McCharles read a paper on "The Extinct Cuttle-Fish in the Canadian North-west."

This paper has been separately published by the author.

In answer to a question by the President Mr. McCharles said sixteen species had been found.

Mr. McDougall remarked on the immense number of shells he had observed in the sand at Selkirk, and with reference to the S. E. glacial drift meeting the other S. W. one suggested that possibly it might be the same drift which had turned N. W. at the supposed place of meeting.

Mr. Bain objected to this that there was no dividing ridge, but that the western limit of the Laurentians was the Lake of the Woods.

Mr. Levey drew attention to the occurrence of boulders in clusters, and stated that in the Lake of the Woods some islands were Laurentian, others Silurian.

Mr. Dale, referring to the interesting specimen produced, alluded to the too extended use of the term "cuttlefish," which should properly be restricted to the belemnites.

Mr. Livingston having asked if any theory was proposed to account for two glacial flows, Mr. McCharles said that it was supposed at that time the Red River flowed south and was a branch of the Mississippi.

NINETEENTH ORDINARY MEETING.

The Nineteenth Ordinary meeting was held on Saturday, 21st March 1885, the President in the Chair.

The minutes of last meeting were read and confirmed.

Mr. VanderSmissen presented the following Report from the Committee appointed to consider the advisability of dividing the Institute into sections, in accordance with the suggestions contained in the President's Inaugural Address.

To the Members of the Canadian Institute :

"Your Committee beg to recommend that the Institute should request the Natural History Society to appoint a Committee from that body, to confer with them on the best mode of dealing with the recommendations and suggestions contained in the Address."

On motion by Mr. VanderSmissen, seconded by Mr. Marling, the Report was adopted.

It was moved by Mr. Marling, seconded by Dr. Kennedy, and carried, "That the Secretary be instructed to correspond with the Secretary of the Natural History Society, requesting him to convey the wish that the Society would appoint a Committee to meet a Committee of the Institute."

The following list of donations and exchanges was read :

1. Monthly Weather Review, Dominion of Canada, for February, 1885.
2. "On the Superficial Deposits and Glaciations of the District in the Vicinity of the Bow and Belly Rivers," by George M. Dawson, D.S.F.G.S., F.R.S.C. Presented by the Author.
3. Proceedings of the American Antiquarian Society, N.S., Vol. III., Part 3.
4. Science, Vol. V., No. 110, March 13th, 1885.
5. Minutes and Proceedings of the Institution of Civil Engineers, Name-Index, Vols. I. to LVIII., Sessions 1837 to 1878-'79.
6. Proceedings of the Royal Geographical Society, Vol. VII., No. 3, N.S. March, 1885.
7. Correspondenz-Blatt der Deutschen Gesellschaft für Anthropologie, Ethnologie, und Urgeschichte, XVI. Jahrgang, No. 1 u 2, Januar und Februar, 1885.
8. Le Globe, Journal Géographique, Organe de la Société de Géographie de Genéve, Tome XXIV., Quatrième Série, Tome IV. Bulletin No. 1, Novembre, 1884—Janvier, 1885.

Mr William Dick was elected a member.

Mr. A. B. Macallum, B.A., read the following paper on "The Alimentary Canal in Ganoid Fishes :"*

The Alimentary Canal in *Acipenser*, *Amia*, and *Lepidosteus* shows several peculiarities of structure over and above what are usually observed in fishes. In some respects these peculiarities may be considered as due to a derivation accompanied by little differentiation from structures which were probably present in the primitive type of fishes.

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* The subject-matter of this short description is treated more fully in a paper communicated to the English Journal of Anatomy and Physiology

Of these, pouch-like deverticula of the epithelium in the œsophageal portion of the fore-gut in the genera named, are in their inflated portion wholly lined by flattened, almost squamous, epithelial cells, each with a flattened nucleus and a quantity of clear protoplasm. The cells in the neck of the pouch are cylindrical, strongly ciliated, and but little differentiated from the common epithelial cells of the œsophageal mucous membrane. The neck varies much in diameter and length, being as a rule about half the diameter of the inflated portion. Pouches of this description are most highly developed in *Acipenser*, least so in *Lepidosteus*. It is impossible to say at present what their function is, but I believe that it is transudatory. They are not glandular in the present definite acceptation of the word, and they cannot be for the purpose of absorbing digested food matter, since they are too far in front of the seat of digestive changes. I have seen no description of like structures as occurring in any other vertebrate.

The œsophageal portion of the fore-gut in *Amia* and *Acipenser* possesses glands similar to those found in the stomach in the same genera, and which undoubtedly secrete pepsin. In this same part of the fore-gut there are gland tubules which, in the cells lining them, show all the degrees of differentiation from a simple epithelial crypt to a fully formed peptic gland tubule. In the same two general œsophagus and stomach act together as a digestive structure, both being provided with peptic glands. In *Acipenser* the part of the fore-gut which has hitherto been termed the œsophagus, possesses taste-buds. in large numbers and cannot, therefore, be rightly so named. The part following it, and terminating behind the mouth of the air duct, must, from the histological structure, be considered as the œsophagus.

The lining epithelium of the œsophagus in *Acipenser* and *Lepidosteus*, and that in œsophagus and stomach in *Amia*, is ciliated. In all, the stomach possesses peptic glands of the type usual in fishes. In *Acipenser*, glands of this character have been previously overlooked, Leydig having described as such the ordinary epithelial insinkings, or crypts, into which the true glands open.

In the mid-gut and end-gut the epithelium is ciliated, the size of the cilia differing greatly, sometimes being so delicate as to resemble the exceedingly fine protoplasmic processes of the same cells in higher vertebrates. Epithelial insinkings and tubules, to which one can with difficulty attribute a glandular function, are present in large numbers in both sections. The epithelium forming them is ciliated, and contains a number of beaker cells. These tubules are undoubtedly the homologues of the Lieberkühnian glands in higher vertebrates.

In *Acipenser*, tubules are present in the mucous membrane of the spiral valve, which are distinguished from those of the neighboring wall of the intestine, in that they are longer and slenderer than those, the cilia of the cells forming them being shorter and more delicate, while beaker cells are wholly absent, but abundantly present in the tubules of the usual kind. Such structures are not very numerous, and it may be that a study of fresh material may show them to be not materially different from the others. In this genus also the epithelium of the spiral valve is very strongly ciliated, and its shallow crypts are abundantly supplied with beaker cells.

One important point in connection with the histology of the spiral valve in *Acipenser* has yet to be noticed. Usually the valve is thick, and a cross section of it shows to what the greater part of this thickness is due: lymph follicles, often over a dozen in number in a single vertical section. Hyrtl described a large lymph organ as forming the greater part of the thickness of the valve in *Acipenser ruthenus*, and Ayers has found something similar in this species and in *Lepidosiren*. These follicles in *Acipenser rubicundus* are, in all probability, the homologues of Peyer's patches which are therefore, so far as is yet known, confined in fishes to *Acipenser* and *Lepidosiren*.

In *Amia* the epithelium of the mucous membrane is ciliated from the pharynx to the vent. Cilia are present in the same extent in *Acipenser* and *Lepidosteus*, except in the stomach.

The pyloric appendage in *Acipenser* and *Lepidosteus* is lined on its inner surface by epithelium, resembling in every respect that of the mid-gut, and completely lacking a glandular character. These appendages, in some other fishes, have been found to secrete pepsin, trypsin, and diastase. This is not the case in *Acipenser*; no enzymes were found when proper precautions were taken to remove the mucus and food matter, which usually gains an entrance by the mouth of the large duct of the organ from the chyme as it escapes from the stomach, and which contains traces of pepsin. Trypsin may gain an entrance also, as the pancreatic secretion is poured into the canal nearly opposite the opening of the appendage. Without taking the precaution of removing the matter present, traces of all the enzymes named were found in the extracts of the appendage. Krukenberg came to a different result with *Acipenser ruthenus*, having found the enzymes normally present in the organ.

A pancreas is present in the three genera. This organ in *Acipenser* is disseminated through the right half of the peritoneal cavity in the liver, and between it and the valvate portion of the mid-gut. The distribution of the pancreatic tubules seems to follow wholly the course of the branches of the *arteria cœliaco-mesenterica*, about which they entwine. The duct of the organ opens on the same papilla on the inner wall of the intestine with the bile duct. This papilla is placed about a centimetre from the tip of the pyloric valve. The tubules of the pancreas are much similar to those observed in other fishes, except that structures analogous to the centro-acinar cells of Langerhans have been observed in them.

A pancreas has been described by Balfour and Parker as occurring in young *Lepidostei* in the form of a rounded organ, situated on the posterior face of the pyloric portion of the mid-gut. I find the pancreas in *Lepidosteus* to be much more extended, its tubules being partly imbedded in the dorsal face of the posterior two-thirds of the liver, and partly entwined about the portal vein, as far back as the posterior border of the pyloric appendage. The organ which was considered by Balfour and Parker to be the pancreas, seems to be an accessory spleen for the greater part, with a few pancreatic tubules in it. The duct of the pancreas opens in common with the bile duct into the intestine, the junction of the two taking place immediately outside the intestinal wall.

A pancreas has not hitherto been found in *Amia*. The reason is that it is imbedded to a large extent in the liver, forming the greater part of the bridge between the right and left lobes. The tubules are arranged about the larger interlobular branches of the portal vein. The duct passes straight backwards, to open beside the bile duct into the mid-gut near the pyloric valve.

Mr. Boyle doubted the statement that the digestive process in snakes is rapid ; his experience with snakes and alligators was to the contrary.

Mr. Loudon also held this opinion.

Mr. Macallum replied that animals in captivity or fear do not digest rapidly ; otherwise they do.

Mr. J. A. Livingston then read a paper on "New Discoveries in Gravitation and its Correlations."

The physical circumstances which modify or enhance the digestive process do not differ in any marked characteristic from those of the higher animals save one: the temperature required is considerably lower. The enzymes seem to have more vigorous action than those of mammals and birds. In the sturgeon, digestion is very rapid, resembling in this respect the process as found in reptiles. In the case of the latter, several specimens of *Storeria* digested frogs of small size in less than an hour; and similar experiments were made with the sturgeon with quite the same results.

TWENTIETH ORDINARY MEETING.

The Twentieth Ordinary Meeting was held on Saturday, 28th March, 1885, the President in the Chair.

The minutes of last meeting were read and confirmed.

Messrs. Carpmael and Livingston were appointed auditors for the year.

The following list of donations and exchanges was read :

1. Report on Canadian Archives by Douglas Brymner, Archivist, 1884.
2. The Pennsylvanian Magazine of History and Biography, Nos. 30 and 31. Vol. VIII., Nos. 2 and 3, June and October, 1884.
3. Transactions of the American Society of Civil Engineers, December, 1884.
4. Selected Papers of the Rensselaer Society of Engineers, Troy, N.Y., Vol. I., No. 2, March, 1885.
5. Science, Vol. V., No. 111, March 20, 1885.
6. Annual Report of the Trustees of the American Museum of Natura History, Central Park, N.Y., for 1884-'85.

7. Bulletin of the Illinois State Laboratory of Natural History, Normal, Illinois, Vol. II., 1884.
8. Description of a New Species of Crinoids with Articulating Spines, by George Jennings Hinde, Ph. D., F.G.S.
9. Proceedings of the London Mathematical Society, Nos. 231-234.
10. Verhandlungen der Berliner Gesellschaft für Anthropologie, Ethnologie und Urgeschichte, Sitzungen vom 18 Oct., 1884, und 15 Nov., 1884.
11. The National Anthem for India, with Translations into several Oriental Languages.

An Account of the Proceedings of a Meeting held in the National Club, Whitehall, with the Speeches in favor of the Anthem Movement.

Report of a Meeting in Grosvenor House, &c., on the same.
Presented by Henry Rowsell, Esq.

Mr. A. McCharles was elected a member.

Mr. A. B. Macallum, B.A., Fellow of University College, read the following paper on

THE NERVE ENDINGS IN THE CUTANEOUS EPITHELIUM OF THE TADPOLE.

The results attained in the study of this subject have given the following : *

1. There are two plexuses of non-medullated fibres, one wide-meshed, placed some distance below the corium, the other very narrow-meshed, situated immediately beneath the epithelium. The first, which may be termed the primary or fundamental plexus, sends up fibres at various distances which pierce the corium and unite with the secondary or subepithelial plexus. The meshes of the latter are often as narrow as the basal surface of an epithelial cell.

2. From the primary plexus, fibres here and there pass up through the corium to terminate in swollen bead-like bodies between the epithelial cells.

3. From the secondary plexus arise minute fibres, which, ascending between the epithelial cells, terminate either within the latter near their nuclei, or between them, or after branching in both fashions.

4. The fibres which enter cells of the basal and intermediate layers of epithelium, are provided with sheathing structures known as the Figures of Eberth, which decrease in size as the cells con-

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* The points treated of in the first part of this abstract, are dealt with fully in a paper published in the Quarterly Journal of Microscopical Science for November, 1885.

taining them show fewer and fewer signs of vitality, that is, as the cells progress towards the superficial layer of the epithelium the Figures of Eberth diminish in size, and in the superficial layer vanish almost completely. This, I think, is an indication that the Figures of Eberth protect the intracellular ends of the nerve fibrils from the vital processes of the cells.

A further study on the same subject has given the following results:

1. The Figures of Eberth are the secretion or rather the production of the intracellular ends of the nerve fibrils, and are not formed from or by the cell protoplasm. This is seen in cases where a Figure of Eberth may be continued outside the cell on the nerve-fibril, or in cases where the cells have been brushed away, but leaving the Figures, which then soon become abnormally large. In the latter no cell protoplasm is present, and consequently the Figures must be produced by the fibrils.

2. Free intercellular nerve endings are produced by the intracellular fibres losing the cells with which they are connected, as in the case when the latter die or are cast off. This is evident from the fact that free intercellular endings are most abundant between the superficial cells.

3. So far as yet observed, the intracellular fibrils never end in the nuclei.

In answer to a question by Dr. Bryce, Mr. Macallum said that the nerves of the retina terminate in the rods and cones, which he illustrated by a diagram.

TWENTY-FIRST ORDINARY MEETING.

The Twenty-First Ordinary Meeting was held on 4th April, 1885, the President in the Chair.

The minutes of last meeting were read and confirmed.

The following list of donations and exchanges was read:

1. The Canadian Practitioner, Vol. X., No. 4, April, 1885.
2. Proceedings of the Academy of Natural Sciences of Philadelphia, Part III., November-December, 1884.
3. Journal of the New York Microscopical Society, Vol. I, No. 3, March, 1885.

4. Science, Vol. V., No. 112, March 27th. 1885.
5. Contributions to North American Ethnology, Vol. V., from the Bureau of Ethnology, Smithsonian Institution, Washington, D. C.
6. Curious Facts Concerning Man and Nature, Medical Series, Nos. 3 and 4. Probable Epithelioma cured by Astringent Washes. Reminiscences of Rev. Dr. Wells. Presented by Dr. Samuel W. Francis, Newport, Rhode Island.
7. The American Journal of Science, April, 1885.
8. Bulletin of the United States Geological Survey, Nos. 2, 3, 4, 5 and 6.
9. The Lineal Measures of the Semi-Civilized Nations of Mexico and Central America, by Prof. Daniel G. Brinton, Academy of Natural Sciences, Philadelphia. Presented by the author.
10. Monthly Notices of the Royal Astronomical Society, Vol. XLV., No. 4, February, 1885.
11. Abhandlungen aus dem Gebiete der Naturwissenschaften; herausgegeben vom Naturwissenschaftlichen Verein in Hamburg, VIII. Band, Hefte I., II., III.
12. Bulletin de la Société Royale de Botanique de Blgique, Tome Vingt-troisième, 1884.

Mr. James Bain, jun., read a paper on "The Present Condition of the old French Fort at Ste. Marie":

Mr. Bain briefly summarized the history of the French mission to the Hurons from 1633 until its destruction in 1649 by the Iroquois.

After describing the fort and church built by the Jesuit Fathers at their mission station of Ste. Marie on the River Wye, near the present town of Midland, he exhibited a ground plan, extracted from the Relations des Jésuites, showing the line of fortification and the moat which surrounded it.

He stated that in 1856 some of the walls were six feet high, but on visiting it in 1884 he was grieved to find that the only traces of it were to be found in a few heaps of earth and broken stone. After describing the general appearance of the surrounding country, Mr. Bain presented to the Institute a plan showing the present positions of the earth heaps and of the depressions where the moat and canal had been.

Mr. Boyle stated that the collection of antiquities on the table was intended as the beginning of a collection to be kept in the Institute, and spoke of the necessity of preserving specimens and records. Ruins should be observed, measurements taken, drawings made, &c. Farmers and others should be asked to be careful of discoveries. He himself had made a discovery of beads in a cave on the Grand River. Referring to Mr. Bain's statement that the Jesuits had planted a hemlock as a memorial of the burial of Brébeuf, he questioned whether a hemlock will last 200 years.

The President, alluding to the statement that some of the Hurons had fled to Manitoulin from the invasion of the Iroquois, said that Manitoulin was not mentioned in the Relations, and suggested that probably Beausoleil Island was meant, where he had seen ruins, which he briefly described.

TWENTY-SECOND ORDINARY MEETING.

The Twenty-Second Ordinary Meeting was held on 11th April, 1885, Dr. G. Kennedy, 2nd Vice-President, in the Chair.

The minutes of last meeting were read and confirmed.

A communication was read from the Governor-General's Secretary, enclosing a despatch from the Earl of Derby, Secretary of State for the Colonies, expressing the high appreciation of Her Majesty's Government of the services rendered by Mr. Sandford Fleming, C.M.G., in connection with the Prime Meridian Conference at Washington.

The following list of donations and exchanges was read :

1. Bulletin of the Essex Institute, Vol. XV., Nos. 10-12, Oct., Nov., and Dec., 1883.
2. Science, Vol. V., No. 113, April 3rd, 1885.
3. Journal of the Franklin Institute, April, 1885.
4. Elephant Pipes in the Museum of the Academy of Natural Sciences, Davenport, Iowa, by Charles E. Putnam, Esq.
5. The Osteology of Amia Calva, by Dr. R. W. Shuffeldt, U. S. Army.
6. Records of the Geological Survey of India, Vol. XVIII., Part 1, 1885.
7. Bulletin de la Société d' Anthropologie de Paris, Tome Septième (III.e Série,) 4e Fascicule, Juillet à Décembre, 1884.
8. Bulletin de la Société Géologique de France, 3e Série, Tome XIII., No. 2, 1885.
9. Mémoires et Compte Rendu des Travaux de la Société des Ingéniéurs Civils, Janvier, 1885, 4e Sérié, 38e Année, 1er Cahier.
10. Boletin de la Academia Nacional de Ciencias en Córdoba (Republica Argentina) Tomo VII., Entrega 3a.

Mr. Ernest E. T. Seton read a paper entitled " Outlines of Ornithology," in which, after outlining the general anatomy of birds, he gave pretty full descriptions of a number of birds found mainly in the Canadian Northwest.

Mr. Boyle had observed the American cuckoo hovering about other birds' nests, and asked if it laid its eggs in them; referred to the fact telegraphe from Australia to the British Association in Montreal of the discovery that the ornithorhynchus lays eggs; and said that the projection on the bill of the female hornbill seemed intended to prevent her from getting out of the nest when imprisoned by the male.

Mr. McDougall had found near Winnipeg four different kinds of eggs in one nest; did not think the prairie lark so musical as the English lark; and referred to the sandhill crane as difficult to approach and swift in running, with a flavour like the wild turkey, although a different species.

In reply, Mr. Seton said there were two species of cuckoo in Canada—the black-bill and the yellow-bill—the former being regular in rearing its young like other birds, but the other very irregular; that the meadow lark has different songs in different seasons; and that the horny projection on the bill of the female hornbill is in breeding time only.

TWENTY-THIRD ORDINARY MEETING.

The Twenty-Third Ordinary Meeting was held on 18th April, 1885, the President in the Chair.

The minutes of last meeting were read and confirmed.

The following list of donations and exchanges was read:

1. **Transactions, No. 1, 1879-80, of the Ottawa Field Naturalists' Club.**
2. **Bulletin of the Philosophical Society of Washington, Vol. 7, 1885.**
3. **From the New York State Library, Albany, Library Reports, 65th and 66th, 1882, 1883; Reports of the New York State Museum of Natural History, 28th, 33rd to 37th; Documents relating to the Colonial History of the State of New York, Vol. XIV.**
4. **The Opportunities of the Medical Profession and their Demands, by W. H. Bailey, M.D.**

5. The Journal of Speculative Philosophy, Vol. XVIII., No. 3, July, 1884.
6. Science, Vol. V., No. 114, April 10th, 1885.
7. Appleton's Literary Bulletin, Vol. IV., No. 2, March to April, 1885.
8. Report of Proceedings of the Seventeenth Annual Convention of the American Railway Master Mechanics' Association in Convention at Long Branch, N. J., June 17th, 18th, 19th, 1884. Presented by J. D. Barnett, Esq.
9. A Primer of Tariff Reform, by David A. Wells, from the Committee of the Cobden Club.
10. "The British Association in Canada," by Sir J. Henry Lefroy, K.C.M.G. Presented by the author.
11. Anales del Circulo Médico Argentino, Año VIII., Febrero, 1885, Tomo VIII., Num. II.
12. Annales des Mines, Huitième Serie, 6e Livraison de 1884, Tome VI.
13. Verhandlungen der Berliner Gesellschaft für Anthropologie, Ethnologie und Urgeschichte, Sitzung von December, 1884.
14. Correspondenz-Blatt der deutschen Gesellschaft für Anthropologie, Ethnologie und Urgeschichte, XVI. Jahrgang, Nr. 3. März, 1885.

It was resolved, on motion by Prof. Pike, seconded by Mr. VanderSmissen: That Dr. Ellis, Mr. Sandford Fleming, Col. Gzowski, Mr. Alan McDougall, Mr. Kivas Tully, Mr. C. Carpmael, Prof. R. Ramsay Wright, Prof. Chapman, Prof. Galbraith, Prof. Pike, Dr. Oldright, and Dr. Bryce be requested to act as a committee to indicate to the City Council the advisability of making an immediate investigation of the currents in the lake near Toronto before taking any steps to decide the position of the trunk sewer.

The following paper on "The Ancient Egyptian Language," by the Rev. George Burnfield, of Brockville, was read by Mr. M. L. Rouse:

ANCIENT EGYPTIAN LANGUAGE.

The small country of Egypt once stood in the van of nations in many departments of arts and science. Egypt proper extends only from the Mediterranean on the north, to Assouan on the south, in lat. 24. The Lybian Desert hems it in on the west, and the Arabian Gulf and the River El Arish on the east and north-east. The area within these limits contains about 100,000 square miles.

The bulk of the arable soil is contained within the triangular shaped Delta. The apex of this triangle may be placed near Heliopolis, a line from this point to Alexandria will represent the perpendicular, another extending towards Pelusium the hypotenuse, while the coast line from Alexandria to Port Said will represent the base.

South of Heliopolis Egypt's arable soil is confined to the Nile valley. Through this valley sluggishly flows the old Nile, of whose source and annual rise Herodotus tells so many marvellous stories. On each side of the river is a level strip of land, reaching back to the flanks of the mountain ranges. The part of this area contiguous to the river only is fertile, while over the remote parts the sands of the Desert maintain the mastery, and a perpetual struggle is carried on by the river on the one hand and the sand on the other.

The valley gradually contracts southward, until the arable land becomes a mere strip which the Fellahîn cultivate in the most Primitive method, and from which they derive the most scanty pittance. These green strips and the few palms, under whose shade the toiling Egyptians find shelter from the sun, are merely sufficient to relieve the monotony of barren sand and sun-bleached hills which meet the eye everywhere else. Only a little more than the tenth of the whole area of Egypt is capable of cultivation, so that only ten or eleven thousand square miles are the producing area. It is plain, therefore, the population must always be very limited.

The most reliable statement gives Egypt now a population of about five million. In a country whose soil is so fertile, and which can produce two crops of wheat a year, a much denser population can be sustained. In ancient times the agricultural appliances seem to have been of the same kind as those now used, and as the Nile is Egypt's perpetual fertilizer, the country was capable of supporting as dense a population then as now. Perhaps at no time has the population been so great as to test the producing power of the soil, for from the 12th Dynasty onwards, the period of Egypt's greatest achievements in war, in architecture and literature, the foreign wars were a steady drain on the population.

In that small country were laid the foundations of mathematics, astronomy and literature; and there, too, art achieved some of its mightiest and finest triumphs. On its soil the flag of almost every civilized nation has been unfurled, and the annals of Egypt, on Papyrus Rolls, on the walls of ancient temples and tombs, record victories over now forgotten tribes and over powerful nations. Such a people is worthy of our study, who could erect massive pyramids and temples, that line the banks of the Nile for nearly 1,000 miles, and where are to be seen columns and capitals carved with a delicacy and fidelity to nature not excelled in the palmiest days of Grecian Art.

In the Egyptian language there is a subject of deep interest to every philologist, as well as to every investigator into the origin and development of the early races to whom we owe so much.

In order to determine the fundamental nature of the Egyptian language, it would be of immense advantage could we determine the original locus of the race prior to its immigration into the Nile valley. One theory is that the race was Hamitic, and came into the Nile valley and the Delta from Ethiopia, which probably represented modern Nubia and Abyssinia. The race, however, seems to have come westward from the Accadian Highlands and the Euphrates valley. They could reach Ethiopia by two ways, either by taking a south-westerly route until they came to the Mediterranean, and thence to the fertile plain of the Delta, or by coming south through Arabia, and then crossing the Arabian Gulf, they could have penetrated the desert, near Suakim, or any suitable landing place in that region, and thence reached any part of the interior. It is scarcely credible, however, that any branch of the primitive stock would have undertaken a march through the terrible desert of the Arabian Peninsula, and would have accomplished a much more perilous task of crossing the Arabian Gulf. A long march southward along the Persian Gulf, and then a passage over the Indian Ocean, south of the Arabian Peninsula, would have been a much more improbable enterprise. The ancient line of travel, between Egypt and the countries on the north-east of her, extended along the Mediterranean shore, through Phœnicia and Syria to Babylon and Nineveh. Moreover, it is an admitted fact that the oldest monuments are in lower or northern Egypt. The Pyramids, the monuments of Memphis, the temple of Heliopolis, and the ancient one at Denderah, are much older than those of the south. This would seem to indicate that the original Egyptians settled first in the north, and gradually moved southward as enterprise or social necessity or war forced them.

Besides it is a logical and forcible inference that there would have been Nigritic blood in the veins of the early Egyptians if they had been either the original inhabitants of Ethiopia, or had by conquest or treaty settled in pre-historic times among the original inhabitants of that country. But the flesh colouring on the most ancient Egyptian tombs is brown with a tinge of red, and the form of the features is not Nigritic. It is not until the time of the 25th Dynasty that there is evidence of Nigritic blood in the veins of the Egyptian Kings. The features of the Sphinx are not Nigritic, and the colouring, yet visible, is of a reddish hue. The lips are full, but that is the case with the Semites, whose original locus was, in my judgment, the same as the first settlers in the Delta. A side view of the Sphinx gives one the impression that the ideal of the sculptor who chiselled the features of that colossal symbol of royalty and wisdom, which has remained a silent and unchanged witness of the rise and fall of kings and of the Egyptian race, was a Caucasian face.

The original immigrants probably came in isolated tribes, and, thus spread over the Delta, would occupy and till an area of soil which would become the property of the tribe that cultivated it. An ancient historic document says that the sons of Mizraim, the people who dwelt in Upper and Lower Egypt, were the Ludim, Anamim, Pathrusim. That is, these were the tribal names of the descendants of the original Egyptians, and some of these names are verified, for they are the names of places in Egypt in historic times. Probably offshoots of those original tribes pushed westward and southward, and though retaining the language of the tribes in the Nile valley, in time they were regarded as an alien people. And we find in the period of the Thothmes and Rameses, and even earlier, that the Egyptians hated the Cushites on the south, and treated them as a foreign people, while they seem to have been able to understand the Cushites, and communicate with them without interpreters.

Whatever their original source may have been, the evidence of the earliest monuments and historical documents is that the Egyptians at that time were a mixed people.

Professor Rawlinson says (R. Vol. I. 100): "Neither the formation of their skulls, nor their physiognomy, nor their complexion, nor the quality of their hair, nor the general proportions of their frames, connect them in any way with the indigenous African races, the Berbers and the Negroes."

Dr. Birch says: "On the earliest monuments they appear as a red or dusky race, with features neither entirely Caucasian nor Nigritic; more resembling at the earliest age the European, at the middle period of the Nigritic races, and at the most flourishing period of their Empire, the sallow tint and refined type of the Semitic families of mankind." (Egypt from Earliest Times, page 9).

This double element visible in the race is evident in their language also. The essence of the language, its blood and marrow, is Semitic, while its form or structure is to some extent Turanian.

Bunsen says (Vol. V., Egypt's Place in History, p. 87): "The Egyptian roots find their organic development in both the Semitic and Aryan system of languages; the Egyptian grammatical forms also contain germs afterwards developed sometimes as Semitic, sometimes as Aryan forms, sometimes as both."

The Egyptian is an agglutinate, monosyllabic language, expressing the persons of the verb and the declensions of the substantives by pronominal forms and prepositions glued to the verbal root and to the substantive.

Let us take the auxiliary verb *au*, "to be," as an example of the agglutinate form of the Egyptian :

SING.		PL.	
aua	I am	aunu	we are
auek aut	thou art	au-ten	you are
auf	he is	au-sen	they are
aus	she is		

The root is *au*, and the final vowel sounds and syllables are contractions of the personal pronouns appended to the root. By a comparison of this verb with the Syriac or Northern Semitic form, we can see that the fundamental root and the structural form is the same in both :

SING.		PL.		
Hit	I was	Haun	we were	
Haut	thou wert	Hautun	ye were	masc.
Hou	he was	Hauten		fem.
Hout	she was	Hau	they were	

The Egyptian and Syriac roots are evidently here from the same source, and if the hieroglyphic or picture form be the most ancient, the Egyptian will be nearer to that original, and while the Syriac and other Semitic forms show they are descendants from that original, yet their modifications are greater. The difference between these two forms is not greater than might be expected from different branches of the same race, isolated for centuries and living under different social and physical conditions. In Egyptian the root is *au*, in Syriac *hau*, a difference only in the rough breathing prefixed to the latter, while the terminations in both, as far as can be traced, are probably contracted forms of the personal pronouns.

The structure of the personal pronouns in Egyptian is decidedly Semitic, and strongly supports the race unity, as well as linguistic unity, of the ancient Egyptians, the Semites of the Arabian Peninsula, Palestine and Syria, and the Semitic Assyrians and Babylonians, who occupied the Euphrates and Tigris valley.

The Egyptian personal pronouns are:

SING.		PL.	
Anak	I	Enen Anen	we
Entek	thou	Enteten	you
Entef Su	he	Entesen Sen	they
Entes	she		

The Assyrian pronouns are:

SING.		PL.	
Anacu	I	anakhni	we
atta	thou	attunu	you
su	he	sun sin sunutu	they
si	she		

The Hebrew pronouns are:

SING.		PL.	
Anochi	I	anachnu	
attah	thou	attem atten	you
Hu	he		
Hi	she	Hem	they, m.
		Hen	they, fem.

The Egyptian relative pronoun is Ma.
The Hebrew relative pronoun is Mah and Mi.
The Assyrian relative pronoun is Man-nu, Man, Ma-a and Mi.

On examination of the substantives there is evidence, in their root form and grammatical structure, of unity of origin in the Egyptian and Semitic languages. There are only two genders in Egyptian, masculine and feminine. This is so also in Assyrian, Hebrew, and other Semitic tongues.

The feminine termination in Egyptian is ⌓, t.
The feminine termination in Hebrew is ath.
The feminine termination in Assyrian is atu, itu, etu.

In Egyptian the plural is formed by adding *u*, or *iu* to the singular, as *Ta* the land, *Tau* the two lands. *Suten* a king, *Suteniu* kings.

The Assyrian plural forms are *anu, unu* and *utu*, from which the Egyptian forms may have come by modification or contraction. The final vowel, however, is the same in both languages.

The most common form of the Assyrian plural, however, is *e* or *i*, which is simply the Hebrew *im* with the final consonant omitted, and there are even examples of this plural form in Hebrew without the final *m*.

In the forms of the numerals there is an evident trace of close family relationship between the Ancient Egyptian and the Semitic languages. It is not so evident in them all, but is quite distinct in a few. And here it seems to me we might naturally expect to find greater difference of form. The Egyptians, from their mental bias, their national public works, and their social customs, continually made use of their numerals. In the measurement of land, in the computations regarding the rise and fall of the Nile, in their architecture and elementary astronomy, they would require frequently to use the numerals. Besides, on the walls of tombs and temples, scribes are seen noting down on their tablet the possessions of the Egyptian noblemen, or the spoils and prisoners of war. In such circumstances, and among such a people, we might expect a *priori* a considerable divergency between the Egyptian forms of the numerals and those of the Semitic and Aryan tongues.

The following table will show the close relationship, however, of a few of the numerals:

EGYPTIAN.		HEB.	SANSKRIT.	ASSYRIAN.	GREEK.	LAT.	GERM.
uá	one	Echad	eka	akhadu or edu	*εἷ*	unus	ein
sen	two	Shenayim		sanie			
ses	six	Shishah	shash	sisatu	*ἕξ*	sex	sechs
sefekh	seven	Shivah	saptan	sibittu	*ἑπτά*	septem	sieben

In the Hebrew for two, the dual form is used, which if we remove, the form then will remain almost identical with the Egyptian. If we take the Hebrew form for six which is employed with feminine nouns, we have *Shesh*, which displays its intimate relationship with the Egyptian *ses*. In the above table it will be seen that the least variety exists in the case of number seven. This seems to me to be accounted for probably in this way. This was the sacred number among the Semitic and Egyptian races, and would be likely, therefore, to undergo less change than the others. The form that embodied their religious ideas would soon come to be regarded as sacred as the ideas themselves. And in this way there would be a strong tendency to retain the form unchanged.

If we examine carefully the Egyptian and Semitic vocabularies, we shall discover a considerable Semitic element as an essential factor of the Egyptian language, not Semitic proper names or terms introduced during the time of the Thothmes and Rameses of the 18th and 19th Dynasties, or even prior. But we shall find a Semitic element in the terms used to denote the simplest objects, and to which every race must have applied names from the time when phonetic sounds were employed to denote either some quality or the essence of an object.

The following table will help to show this relationship by a few examples:

EGYPTIAN.		HEBREW.		ASSYRIAN.		SANSKRIT.	LAT.	ENGLISH.
ma	water	mayim		me				
ab	a priest	ab	a father	abu				
mut	mother	em		ummu	a father	mâtri	mater	mother
mut	to die	muth		mutu		mari	morior	murder

EGYPTIAN.		HEBREW.		ASSYRIAN.	SANSKRIT.		GREEK.	LAT.
Bet	a place	Baith	a house	Bitu	Bhû	to be	*Fόικος*	
Neb	a Lord	Nabi	a prophet	Nabu	Naripa	a prince		
Ar	to be, to do	El	a god	ilu	Isvara	a god, one who possesses		ille

Thus far, I think, I have proved the truth that the Hieroglyphic language is Semitic, to a considerable extent, both in its essence and grammatical structure, which so far gives evidence in support of the race unity between the Egyptians, the Semitics, and also the Assyrians and Babylonians. Besides, I think, we have seen here and there in the features of some of the Aryan languages sufficient resemblance to the ancient Egyptian Hieroglyphic to warrant us in the opinion that if she be not their old mother, she is, at least, a very ancient relative, whose form, to some extent, as a hereditary inheritance, they retain even to this day. Thus the ancient Egyptians were related in race and language with the warriors of the Euphrates valley, and the Semites of Syria, Palestine and Arabia, and also with the Greeks, Latins, Teutons, who, in later days, made their power in arms, in literature and art, felt among the nations that have risen since.

The Egyptians employed three distinctive species of writing, Hieroglyphic, Hieratic and Demotic. The first was used on massive columns, and on the walls of temples and tombs. The second and third forms were used on the papyrus rolls, were merely cursive forms of the Hieroglyphic, and were employed when education became more common among the masses of the Egyptians.

Generally it may be stated the most ancient form of writing among the Egyptians was symbolic, that is, certain forms were employed to represent specific objects. At that time their language was in the same stage as that of the Aborigines of this continent, whose pictorial representations are yet visible in parts of Canada, or of the Aborigines of Mexico, who, to some extent, employed the same method, and who probably would have reached in time a phonetic stage in their language, when the same or other forms would have conveyed their ideas and the names and qualities of objects.

This stage of human language is a primitive one, and dates back to the time of the Assyrian and Babylonian Empires, whose annals are recorded in the cuneiform on the clay bricks and stone cylinders found in the libraries and ruins of Nineveh and Babylon. Its progenitor, the Accadian, seems to have been a hieroglyphic language in which specific forms represented an idea or an object. The Assyrians, the successors of the Accadians, attached phonetic values to the forms, and perhaps modified them into the cuneiform as now found on the monuments in the British and other museums. As an example of this change let us take the word for sun. Its primitive Accadian form was as nearly circular as straight strokes would admit. The Assyrians changed the form into a perpendicular line, preceded by two lines at an angle, attached a phonetic value and pronounced it *samse.* In Egyptian the form to denote the sun was a circle with a dot in the centre. Afterwards, when the phonetic stage was reached, the phonetic value of *ra* was given to it, and the original form was placed as a determinative after the phonetic signs employed to express the syllable ra.

The Egyptian Hieroglyphic forms were occasionally used figuratively. In some instances we can easily trace the figurative meaning of any particular form from the literal; in others this is impossible, the figurative meaning having been imposed arbitrarily, or at least the connection between them is not now perceptible. The circle which denotes "sun" signifies also "day" in many of the texts, though not the usual word. The connection here is quite obvious. The sun-god was supposed to sail across the sky in his boat, and then to sink into Amenti or the Western Hades, whence he rose every morning from the Eastern horizon. One journey of the sun-god being a day, the same word Ra denoted both the sun and also a day. The serpent was the symbol for asp, and also denoted a "god," and is found on the crown of some of the old Egyptian rulers, signifying the power and wisdom of the king. It is quite easy to perceive the figurative use of the serpent form. The sting of the Cobra was incurable by any known Egyptian remedy. Probably, therefore, to propitiate it, and also as a tacit acknowledgment of its deadly power, they gave it a place in their Pantheon.

The segment of a circle signified both the moon and a month, for the Egyptian month seems to have been determined by the lunar revolutions, and the year to have consisted of so many of them, with intercalated days at the end of the year.

In the old Assyrian the same method was adopted with a slight variation. The wedges placed as nearly as possible in the form of a circle denoted the sun. Three angular figures denote 30. These figures placed within the circle denoted the month, consisting of 30 days. The modern Assyrian form was modified into - ¯ ¯ ___¦, with the phonetic value of *Arkhu*.

From the earliest historic time the Egyptian hieroglyphs were phonetic. They represented either a letter or a syllable, which was resolvable into its separate letters. The following method was adopted in employing a sign to convey a particular sound. They employed an object, which was denoted by a word, whose first letter was identical in sound with that which they wished to express. Hence the Eagle was the sign of the A sound, because the name of the Eagle in Egyptian *Akhôm* contained in its first letter the sound required. A reptile became the sign of the letter T for the same reason, for the first letter of *Tetef*, the Egyptian for reptile, begins with the sound required.

The Egyptians increased the difficulties of their language by arbitrarily employing a number of signs to convey the same sound. To denote the sound of A they used a palm branch, the figure of an Eagle, and a hand with the arm outstretched to the elbow.

To express the sound of the letter T they used the palm of the hand; two parallel lines, united at one end by a curved line and terminating at the other in small circles; and the segment of a circle. Their numerous syllabic signs, and the use of various signs to express the same sound, must have made the study of this interesting language a laborious business to the common people. And in this fact, among others, we can see how very naturally the Egyptian scholars were the Egyptian priestly class, and the men of leisure.

The Ethiopians were known to the Hebrews as Cushites, the same name by which the Egyptians designated them on the monuments. But the most ancient historic document we have classifies the Cushites, Canaanites and Egyptians as originally tribes from the same Hamitic stock. This fact is supported by independent and valid evidence. From the earliest historic times a most intimate connection existed between Egypt and Ethiopia on the south. The Ethiopian armies served with the native Egyptian, and the Egyptian kings found an asylum and support there when their own land was invaded and subdued by foreign enemies. The kings of Egypt even married Ethiopian princesses, when no state reasons required them to form such a bond of union with their southern neighbours. In all this varied intercourse no interpreters were employed. No record, at least, is given of such a fact, and we may reasonably infer, therefore, that the Egyptians understood the language of the Cushites, and therefore that the Egyptian and Cushite language were similar, if not identical. From these facts it might be inferred a *priori* that there would be an essential resemblance between the Egyptian Hieroglyphic and Ethiopic, and this is true as a matter of fact, From this brief survey of the ancient Egyptian Hieroglyphic, I think we may deduce the following conclusions:

1. That it is closely allied with the Accadian and the modern Assyrian, as found on the tablets and monuments discovered in the ruins in Mesopotamia.

2. That the Egyptian Hieroglyphic is in some of its fundamental parts Semitic, and points to a common origin with Hebrew, Syriac and Arabic.

3. That it was the same in its origin and essence as the language of the Cushites on the south, which is substantiated by the fact that there is a somewhat close affinity between the Egyptian Hieroglyphic, or its descendant the Coptic, and the Ethiopic.

4. That an affinity exists between the Egyptian and some of the Aryan languages, as Sanskrit, Greek, Latin and German.

5. And as a final conclusion of the survey of this archaic language once spoken by the race that has left behind it the most lasting

colossal and ingenious works of their skill and industry on earth, we can see that comparative philology helps its sister science Ethnology, and tends to lessen the area on which rose the primeval language, and strengthens the probability of the origin of the race and of language from one original centre.

TWENTY-FOURTH ORDINARY MEETING.

The Twenty-Fourth Ordinary Meeting was held on 25th April, 1885, the President in the Chair.

The minutes of last meeting were read and confirmed.

The following list of donations and exchanges was read:

1. Monthly Weather Review, Dominion of Canada, March, 1885.
2. First Supplementary Catalogue, Central Circulating Library, Toronto.
3. Bulletin of the Natural History Society of New Brunswick, No. IV.
4. Transactions of the American Society of Civil Engineers, January, 1885.
5. Transactions of the Buffalo Historical Society, Part III. Obsequies of Red Jacket at Buffalo, October 9th, 1884.
6. Science, Vol. V., No. 115, April 17th, 1885.
7. Bulletins of the Illinois State Laboratory of Natural History, Nos. 1, 2, 5, 6, and Vol. II.

   Twelfth and Thirteenth Reports of the State Entomologist on the Noxious and Beneficial Insects of the State of Illinois.
8. Monographs of the United States Geological Survey, Vol. IV. " Comstock Mining and Miners," by Eliot Lord.
9. Proceedings of the London Mathematical Society, Nos. 235–236.
10. Proceedings of the Royal Geographical Society, N.S., Vol. VII., No. 4, April, 1885.
11. Trübner's American, European, and Oriental Literary Record, Nos. 207-208, N. S., Vol. VI., Nos. 1-2.
12. Transactions of the Manchester Geological Society, Parts IV., V., VI., VII., Vol. XVIII., Session 1884-'85.
13. Archivio per l'Antropologia e la Etnologia, Quattordicesino Volume, Fascicolo Terzo.
14. Atti della Società Toscana di Scienze Naturali, residente in Pisa, Memorie, Vol. IV., Fasc. 3o.
15. Bulletin de la Société d' Anthropologie de Paris, Tome Septième, (IIIe Série,) 5e Fascicule, Décembre, 1884.
16. Mitheilungen der Anthropologischen Gesellschaft in Wien, XIV. Band, IV. Heft.

Messrs. C. G. Richardson and W. T. Tassie were elected members.

Nominations for Officers for the ensuing year were then made.

Mr. Frank T. Shutt, B.A., read a Paper on "The Anatomy of the Wood-Louse," illustrated by diagrams and specimens.

The following is an abstract:

NOTES ON THE ANATOMY OF THE WOOD-LOUSE.*

This paper opened by discussing the various classifications of the Crustacea by Huxley and others, and concluded its remarks upon this subject by adhering to the classification which places the Oniscidae as a family of the Isopoda, the latter being ranked as an Order of the Edriophthalmia.

A general description of the anatomy of the Isopoda followed, which points out the most characteristic features that serve to distinguish the forms of this order from those of related orders, *e.g.*, respiratory function of lamellate abdominal feet; absence of Cephalothorax, etc.

The life-history of the members of this Order was then briefly outlined, and it was shown that although the vast majority of them were marine, many were fresh water types, and others, as the Oniscidae (to which the Wood-Louse belongs) were terrestrial. The fact was also noted that such terrestrial forms were always found in damp places, and therefore that moisture was necessary for the act of respiration. The family of the Oniscidae, while somewhat isolated, is yet a widely spread group, being found in both Hemispheres, and as far north as Greenland.

The anatomy of the parts and appendages was then fully described, the descriptions being accompanied by drawings made by the Author.

The segments of the head, thorax and abdomen, as to their shape, colour, etc., first received treatment, and then a more minute account of the attachments followed.

With regard to the appendages of the Head, the most important features to be noticed are—the possession of a single pair of Antennæ. These are the Antennæ proper. This seems to point to a high degree of development in the Oniscidæ, and in conjunction with the fact that the mandibles possess no palps causes them to resemble some of the Myriapoda. The eyes are sessile, black, slightly convex, and are oval in outline; they consist of an aggregation of ocelli. The Maxillipedes are broad, lamellate structures, and of comparatively large size. Their inner margins meet in the median line, and are nearly straight. A short, thick palpus, of three joints, is borne by each Maxillipede on its upper and outer margin, in front of which it projects. The under-lip is attached to the Maxillipede, and is produced externally to it. The second pair of Maxillæ is flat, foliaceous, and of the same breadth throughout. It bears a cap of chitine on its upper and inner angle. The inner or first pair of Maxillæ possesses both endopodite and exopodite; the latter is considerably the longer and stouter, and bears five inwardly-curved chitinous denticulations, and its outer border is beset with fine setæ. The endopodite is composed of two joints, both slender, the upper one tipped with two feather-like setæ. The Mandibles are strong and of considerable thickness, being circumscribed by a horny skeleton and bearing three bluntly pointed teeth at their apex, and patches of fine setæ on their inner and outer edges. The Labrum, above the Mandible, is apparently a paired structure. It protects the oral aperture. In structure it is foliaceous, and may be regarded as a median growth of the sternum of this region.

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* This paper was awarded the McMurrich Medal, Univ. Coll., Toronto, 1885.

The Thoracic Appendages, seven in number, bear a strong simi, larity one to another. They are composed of seven joints, and none are chelate. A more exact description of them then followed.

Of the six abdominal appendages five are concealed under the abdomen—the uropods (appendages of the sixth somite) projecting behind. The various modifications of these abdominal appendages in the sexes then is dwelt upon at some length.

The uropods are alike in both sexes, and consist of a basal segment bearing two rami.

The President, for Dr. Robert Bell, of Ottawa, read the following paper on "The Mode of Occurrence of Apatite in Canada," by Robert Bell, B.A.Sc., M.D., LL.D., Assistant Director of the Geological Survey of Canada:

The mode of occurrence of apatite in the crystalline rocks of Ontario and Quebec, has been a puzzling question to geologists ever since the mineral has been known to exist among them in quantities of economic value. A number of contributions to a knowledge of the subject have been made, principally by Sir W. E. Logan, Drs. Hunt, Dawson, and Harrington, Professor Dawkins, and Messrs. Vennor, Broome, Willimott, Kinahan and Torrance.

The scientific aspects of the subject are discussed more particularly by Dr. Harrington in the Geological Survey Report for 1877–'78, and by Dr. Hunt in several of the Survey Reports, and also in an excellent paper in the Proceedings of the American Institute of Mining Engineers, in which he gives valuable statistics of the production of Apatite in the Dominion. The rapid progress which has been made in mining the Apatite during the last two or three years, has enabled us to obtain some additional light on this question.

With the exception of one locality at Lake Clear, in the County of Renfrew, the workable deposits as yet known are confined to two areas having similar geological characters and relations, the one running north, in the County of Ottawa, and the other south-west, through parts of Lanark, Leeds, and Frontenac. Apatite has been found in other regions in Canada, but for the present I shall confine my remarks to the two areas I have mentioned, and moreparticularly, to the one in the County of Ottawa, which latter I have had more opportunities of examining than the other.

The Apatite-bearing rocks belong, as is well known, to the Laurentian system, and they appear to constitute one of the higher members of the series. Although the Laurentian system extends over such vast tracts of country in the northern regions of the Dominion, rocks like those among which the Apatite occurs appear to occupy but a small proportion of the whole area. In the great regions referred to, scarcely anything is to be found but wearisome repetitions of the commonest varieties of greyish and reddish felspathic and quartzose gneisses—massive, highly crystalline, hard, granitoid, or not much more cleavable in the direction of the lamination than across it, greatly contorted on the small scale, and so much disturbed on the large scale that it would be almost impossible to map out all the windings and foldings in any given given area.

In the Apatite-bearing regions on the other hand, the rocks on the large scale, or geographically speaking, are arranged in great belts, differing more or less from one another, and individually traceable for long distances, in which they maintain their distinctive characters. The limestone bands which they contain constitute the great distinguishing feature in which these strata differ from the bulk of the

Laurentian rocks. In the immense northern Laurentian country to which I have referred, and which occupies many hundreds of thousands of square miles, no limestone bands have yet been detected, although it is probable that other areas of the higher portions of the series containing such bands may yet be found. The Laurentian areas at present known to hold these limestones lie along the southern parts of the Dominion between the French and the Saguenay Rivers. Limestones are also found in rocks classified as Laurentian in Cape Breton and Newfoundland. In the apatite regions the gneisses of some of the bands are less crystalline than the primitive varieties above described, and they are recognizable throughout by certain peculiarities of color, composition, &c. They are seldom so much disturbed as to prevent them from being traced out upon the ground. While the common Laurentian gneiss holds but a small variety of minerals, the rocks of the apatite regions have already yielded upwards of sixty species. Both in the county of Ottawa and in the Perth and Kingston regions there are several wide bands of crystalline limestone rudely parallel to one another and separated by great thicknesses of gneissic strata. These are similar to the thick bands of limestone in the gneisses of the county of Argenteuil, which were so carefully traced out in all their windings by the late Sir W. E. Logan between the years 1854 and 1862. Apatite has been found in various places in this region, but apparently not in paying quantities so far as is yet known.

Besides the limestones, the Laurentian rocks of the apatite regions have associated with them bands of schists, slates, pyroxenite, quartzite, jasper, etc., and they also contain serpentine, graphite, pyrite, pyrrholite and ores of iron, copper, lead and other metals.

Coming now to the closer associations of the apatite itself, we find that it is almost invariably accompanied by pyroxenite, which may be either coarsely or finely crystalline and of any shade of green, greyish-green, and grey. A somewhat coarsely crystalline orthoclase rock, generally very light grey in color and spotted and mottled with pink, lilac and neutral grey is generally found with the apatite, especially in the valley of the Rivière du Lièvre. The other minerals most commonly associated with it are dark mica, which in most cases is biotite, but may occasionally be phlogopite, pyrite, white, red, pink, flesh and salmon colored calcite.

In some localities, as in the township of Wakefield, the apatite is accompanied by a very crystalline and distinctly spotted or mottled diorite in which the hornblende is dark green or black, and the felspar white, grey or reddish. A dull red, rather fine-grained gneiss, streaked and spotted with dark grey or black, is found in proximity to the apatite deposits in some parts of Ottawa county. Interstratifying the gneiss near a number of the apatite deposits in the valley of the Lièvre, I have noticed thin seams and also beds, up to several feet in thickness, of a quartz-rock which is white or light bluish in color, semi-translucent, non-crystalline or compact, pitted or honeycombed on weathered surfaces, the cavities being apparently due to the dissolving away of felspar.

It is well known that some of the metals exhibit a preference, locally at all events, for certain rocks which, as the miners say, are "kindly" to them; as for example (among the old crystalline rocks), oxides of iron with hornblende schists, galena with limestone, sulphides of copper with greenstone and talcoid schists, gold with quartz, tin with granite, etc. There is thus nothing extraordinary in the association of the apatite of the Laurentian system with pyroxenite.

We have seen that, in regard to the apatite of Ottawa county at any rate, there are certain pretty well ascertained geological and mineralogical associations, so that should we find these conditions repeated in another region, among the widely-spread Laurentian rocks of Canada, we may look with some confidence for apatite. These conditions may be briefly recapitulated as follows: a somewhat regular large-scale structural arrangement of the gneiss in bands, having distinctive characters and accompanied by limestones, a considerable number of "the Laurentian minerals," and the presence of pyroxenite or of mottled diorite. For these reasons I have ventured to predict the probable discovery of apatite in the Parry Sound district ever since 1876, when I made a geological reconnoisance of the district and found five distinct limestone bands, of which the general positions and courses were indicated, and to which I gave separate names—(See Geol. Survey, Report of Progress, 1876-77, pages 202-208). The general structure and character of the Laurentian rocks to the north-eastward of the Georgian Bay would place them among the higher divisions of the system. In this region I also found the mottled diorites and the pyroxenites which, in the county of Ottawa, indicate the proximity of apatite. A considerable number of the mineral species which usually accompany the Laurentian limestones was also found.

In the county of Ottawa the most productive "phosphate belt" as yet known runs northerly and follows the general course of the Rivière du Lièvre. It has been traced through the townships of Templeton and Buckingham, Portland, Bowman, Bigelow and Wells, and I have been credibly informed that the mineral has been found in places in this direction to a distance of 100 miles from the Ottawa. In the Perth and Kingston region, the phosphate belt runs from the township of North Elmsley south-westward through North Burgess, North Crosby, Bedford, Storrington and into Loughborough.

There is little doubt that the apatite has been derived principally from the pyroxene rocks. Phosphate of lime in small quantities is a common constituent of igneous rocks. Dr. Harrington has shown that the trappean rocks of the isolated mountains in the Province of Quebec contain it in very appreciable quantities, and it has been met with in the amygdaloids of the Bay of Chaleur. I have found bunches and crystals of apatite associated with amygdaloid and syenitic granite at Trout Lake at the source of one of the branches of the Moose River. There is no evidence whatever that the Laurentian apatite has had the remotest connection with organic life, although it is a rather curious circumstance that the average proportion of fluorine in this anciently formed mineral should approximate that contained in the bones of mammals.

The pyroxenite appears to take the form of irregular beds and almost isolated masses running with the stratification, but these have been altered in shape and partially dispersed during the metamorphism of the whole mass containing them. They have probably been originally derived from igneous sources and have perhaps formed parts of submarine ejections while these ancient rocks were in the course of deposition; or they may have been intruded subsequently. They have since all undergone great alteration and disturbance, in the course of which they have been in a heated and somewhat plastic state and have become more or less mingled with one another. It was at this remote period that the irregular and somewhat ill-defined veins of the second and third class described by Dr. Hunt as belonging to such rocks were formed—(Geol. Survey, Report of Progress, 1863-66, p. 187). These veins are very numerous among all the Laurentian rocks. They are filled with the prevailing constituents of the country rock which they may happen to traverse, such as felspar, quartz, calcite, pyroxene, apatite, mica, etc., or with some of these minerals mingled together. The gangue adheres strongly to the wall-rock which to a certain distance in is often penetrated by a greater or less proportion of the veinstone.

All writers on this subject have dwelt on the great irregularity and the puzzling character of the apatite deposits. At first the deposits were supposed to be beds, but they are now pretty commonly regarded as being rather of the nature of veins of an irregular and unusual nature. Regular veins, generally of small size, filled with apatite or having this mineral as one of the veinstones have also been described by writers on this subject. On the 2nd lot of the third range of the township of Bowman in Ottawa county, I have seen a well defined small isolated vein of pyroxene, cutting gneiss and holding masses of apatite along its centre. The mine at Little Rapids on the Lièvre appears to be in a large vein. These are probably instances of regular veins of very ancient date. But in the great majority of cases the deposits, whether of the pure phosphate or of a mixture of this with other minerals, appear to differ from true fissure veins and to be extremely uncertain and capricious in their forms.

The mineral is often much mingled with the pyroxenite, but it always has a tendency to form itself into floors and branching veins, having two principal local courses. From an attentive study of these in several of the mines which have been opened in the Lièvre valley, I have come to the conclusion that these lines of deposit mark approximately the original jointing of the rock. These ancient joints belonged to three sets, two nearly vertical intersecting each other, and one nearly horizontal, analogous to the three sets of dry joints of more recent date, which we usually see in massive rocks at the present day. In the course of the disturbances to which these phosphate-bearing pyroxenites and gneisses were subjected, the angular masses into which they had been divided by these joints became in places separated and displaced, leaving the spaces which are now filled with the apatite. The process—one of segregation—was similar to that by which the irregular veins in other varieties of the Laurentian rocks have been filled with quartz and orthoclase or calcite and its associated minerals. Indeed it has been pointed out that the tribasic phosphate of lime shows an unusually strong tendency to segregate or separate itself from mixtures containing it. Hence we should expect to find that even when it formed only a small proportion of the constituents of the rock in which a cavity occurred, it would fill it up to the complete or partial exclusion of the more abundant minerals. We do not know the precise nature of the conditions which have caused the elimination of individual minerals from the country rocks, and their deposition in the veins which traverse them, but from the above considerations it is easy to conceive that the phosphates might be separated out into cavities from the enclosing rocks, in which the mineral is now but sparingly diffused, especially when we consider that apatite is soluble in heated waters holding alkaline silicates, whereas the felspars and pyroxene are not thus soluble.

In the formation of the apatite masses, or of any other vein-like deposits, it is not necessary to suppose that the whole space which they now occupy was open at once like an empty cavity, or indeed that it was ever open at all to any appreciable extent, but only that where the slightest vacancy occurred from movement in the wall-rock, it was immediately filled by particles of one or more of the minerals of the parent rock, for the transference of which the conditions were for the time favorable.

The general form of the apatite deposits as seen in a section across any of the courses of the primeval jointing approximates what we should expect to find if the above hypothesis be correct. A vein in descending, after following an ancient vertical joint past several nearly horizontal branches, may suddenly jog off to another parallel joint to which the original opening had been transferred by a lateral movement on the plane of one of the horizontal joints. The horizontal branches which are sometimes as large as the veins themselves, when exposed in place, constitute the "floors" or "beds," and they are as likely to be cut off by throws along the planes of the vertical joints as are the veins by throws along the horizontal joints. In this way either vertical or horizontal masses of apatite may be cut off suddenly all round or they may pinch out gradually or irregularly. The latter would result from the disturbance of the blocks of the country rock all separated from each other by the three sets of joints during the movemements which took place while the strata were in a plastic condition. Both the veins and "floors" of apatite are sometimes observed to curve or gradually change their dip. This form may have been imparted to them, either during or subsequent to their formation.

The structure I have attempted to describe is best seen where the phosphate-producing rock is least disturbed and where the joint-fissures are moderately small and close together, but the same arrangement obtains among the larger deposits. The principal mass in a working sometimes passes from a vertical joint to one in another set, or from one of the latter to a horizontal joint, thus giving the mass the form of the letter L as seen in plan in the first instance or in vertical section in the second. An example of the first of these forms on a large scale is described by Mr. Torrance as occurring at Major Chapleau's Mine on lot 17, range VI, of Portland, East—(Geol. Survey Report of Progress, 1882-84, page 16 J.)

Along the intersections of any two of the planes of the joints, an more especially at the points where all three intersect one another, the apatite is accumulated in the largest quantity. The angles of adjacent blocks are frequently rounded off and thus larger spaces are found for the deposition of the mineral. Sometimes the apatite follows only one set of vertical joints, when it appears as parallel veins; at others it is nearly confined to the horizontal ones, when it forms a succession of "floors," and again it may follow both of the vertical sets or even all three, in which cases it appears in a reticulating form, which is of very common occurrence.

If the above view of the nature of the majority of our phosphate deposits in the pyroxenite be correct, we should naturally expect to find the mineral most freely exposed where upward movements of the apatite-bearing rocks had occurred, and that the deposits of the mineral between the blocks of the country-rock would be widest above, and further, that in going downward they would become pinched towards the next leading horizontal joint below, where they would open out again; also that the successive bunches of the mineral would become smaller and smaller in descending. These conditions appear to correspond with the experience of mining so far.

The great numbers of small "shows" which are found on the surface among the apatite-bearing rocks appear to afford additional proof of the correctness of the view I have put forth. Many of these have been worked to a small extent on the surface by farmers and others, but the great majority of them show a tendency to pinch out at a limited depth, when they are usually abandoned. As many as 300 of these "shows" have been opened on a single lot. Dr. Hunt and Mr. Gordon Broome have both described a group of about twenty nearly parallel veins of apatite on lot 4, range V, of North Burgess. (Geol. Survey Reports, 1863-66, pages 226-27, and 1870-71, page 317). They all diminish rapidly north-westward in receding from the shore of Rideau Lake and may belong to the class of parallel joint-deposits I have described. In this township, and those adjacent to it, the apatite is often found in isolated crystals and masses in calcite or coarsely crystalline limestone, which is generally of some reddish shade and is mostly associated with or near to the pyroxene rock. These deposits Dr. Hunt regards as veins also.

Apatite has been detected in a very large number of places in the two principal regions above referred to and in a good many localities in Renfrew connty. In addition to these, it has been found in Canada in crystalline limestone in the Augmentation of Grenville and at the Calumet Falls in the latter township, at St. Roch in the parish and county of Assumption, in an intrusive mass of fine grained grey dolerite, in the township of Barford (Eastern Townships), in a vein of quartz with copper pyrites, native copper and mica. I have also found it in crystals with mica in a compact grey dolomite in the township of March, county of Carleton. It is mentioned among the minerals brought home in 1878 by Mr. Ludwig Kumlien from Cumberland Inlet, where the rocks are believed to be Laurentian. I may mention, in this connection, that near North Bluff in Hudson's Strait I have picked up a piece of crystalline limestone quite like one of the common Laurentian varieties. Sir John Richardson found apatite in the neighborhood of the Coppermine River.

I have already noticed its occurrence in igneous rocks at Trout Lake, north of Lake Huron, in the isolated mountains of the Province of Quebec, and on the Bay of Chaleur.

If the view I have taken of the mode of occurrence of our principal apatite deposits be not sufficiently elaborated or satisfactory, it may at all events point the way to further investigations in this direction.

Mr. Notman mentioned the view that phosphates being fertilizers, must be of animal origin.

Mr. Shutt, referring to a recent paper by Dr. G. Dawson maintaining that view, argued against it by showing that the

Norwegian phosphates have no fluorine but chlorides instead, and therefore must have had their origin before animal life.

Mr. Levey thought phosphorus in the rocks a primary element; in bones, only a secondary.

Mr. Livingston remarked that other stones besides phosphates were fertilizers.

The President said that the analysis of the phosphates was similar to that of bones, but that was no evidence that vegetable preceded animal life; that iron and carbon occur in connection with organic remains; without carbon there is no life; phosphates occur in the same rocks with graphite, eozoon Canadense and crystalline limestone; and even accepting the view stated, the difficulty is only carried a step back.

ANNUAL MEETING.

The Thirty-Sixth Annual Meeting was held on 2nd May, 1885, the President in the Chair.

The minutes of the last annual meeting were read and confirmed.

The following list of donations and exchanges was read:

1. The Canadian Entomologist, Vol. XVII., No. 3, March, 1885.
2. Report of the Minister of Education (Ontario), for 1884, with the Statistics of 1883.
3. The Canadian Practitioner, May 1885.
4. Monthly Health Bulletin of Ontario for December, 1884, and January and February, 1885.
5. Science, Vol. 5, No. 116, April 24th, 1885.
6. Journal of the Franklin Institute, May, 1885.
7. Annual Reports of the Trustees of the Peabody Academy of Science, Salem, Mass., 1874 to 1884.
8. Monthly Notices of the Royal Astronomical Society, Vol. XLV., No. 5, March, 1885.
9. Journal of the Royal Microscopical Society, Series II., Vol. V., Part 2, April, 1885.
10. Memoirs of the Geological Survey of India, Vol. XXI., Parts 1 and 2. Do. Palæontologia Indica, Series XIII., Vol. I., Part 4. Fasciculi 3 and 4.

11. Boletin de la Academia Nacional de Ciencias en Córdoba (Republica Argentina), Tomo VIII., Entrega la.
12. Añales del Circulo Médico Argentino, Año VIII., Marzo, 1885, Tomo VIII., Num. 3.
13. Ymer Tidskrift utgifven af Svenska Sällskapet für Antropologie och Geografi, Häft 1884 (Fjere argangen), 5e, 6e, 7e, och 8e, 1885 (Femte ärgoangen), 1c, Häftet.
14. Mémoires et Compte Rendu des Travaux de la Société des Ingénieurs Civils, Janvier, 1883 ; Juin et Juillet, 1884 ; Annuaire de 1885.
15. Verhandlungen der Gesellschaft für Erdkunde zu Berlin, Band XII., Nos. 1, 2, 3.

Mr. Joseph J. Woodhouse was elected a member. The Secretary read the Annual Report, as follows :

ANNUAL REPORT OF THE CANADIAN INSTITUTE.

SESSION 1884-85.

The Council of the Canadian Institute have the honour to lay before the members their Thirty-Sixth Annual Report.

During the past session twenty-four meetings have been held, at which thirty papers have been read. The character of the papers and the degree of interest shown in the meetings have been highly satisfactory.

It is gratifying to observe that the membership continues to increase, forty new members having been added to the roll during the past session.

The interest taken by members in the Library and Reading Room also continues to grow, as shown by the fact that while last year 860 books and periodicals were issued to members, the number this year was 1,533.

Last year an effort was made to bind the transactions and periodicals, which have for some years been allowed to accumulate. The effort has been continued this year, during which 161 volumes have been bound and placed on the shelves.

The number of transactions of learned societies received in exchange for our Proceedings continues to increase; one hundred and sixty societies having this year sent copies of their publications.

It is highly gratifying to the Council to call attention to the fact that at the International Conference held at Washington in October, 1884, for the purpose of establishing a prime meridian, the proposals first made at a meeting of the Canadian Institute by Mr. Sandford

Fleming were largely adopted. All the papers on this subject have been placed in the printer's hands, and the Council hope shortly to lay them before the Institute.

We append statements showing: 1st, the membership; 2nd, the financial condition; 3rd, the number and sources of donations and exchanges; 4th, the number of books and periodicals issued to members; 5th, the list of periodicals subscribed for; 6th, the list of periodicals presented to the Institute, with the names of the donors.

All of which is respectfully submitted.

W. H. ELLIS, *President.*

TORONTO, May, 1885.

APPENDIX I.

MEMBERSHIP.

Number of Members, April 1st, 1884	236
Withdrawals and Deaths during the past year	32
	204
Elected during the Session, 1884-85	40
Total number of Members, April 1st, '85	244
Comprised of:	
Honorary Members	6
Life Members	16
Ordinary Members	222
Total	244

APPENDIX II.

TREASURER IN ACCOUNT WITH THE CANADIAN INSTITUTE—SESSION OF 1884-85.

To Summary:	
" Balance on hand	$ 71 50
" Annual Subscriptions	570 25
" Rents	143 50
" Journals sold	101 89
" Books and Periodicals sold	79 23
" Interest on Deposits	8 14
" Donation	50 00
" Government Grant	750 00
	$1,774 51

By Summary :

" Salaries	$342 75
" Periodicals	104 56
" Interest on Mortgage	238 78
" Printing	349 14
" Fuel	99 50
" Gas	44 80
" Water	21 00
" Postage and delivering Journals	24 50
" Express	16 04
" Stationery	2 45
" Furniture	101 80
" Fencing	68 50
" Binding	183 70
" Caretaker for Sundries	10 00
" Stuffing and Preparing Specimens	32 40
" Repairs	40 20
" Insurance	52 00
" Taxes	9 49
" Contingencies	9 27
" Cash on hand	23 63
	$1,774 51

Examined and found correct.

CHARLES CARPMAEL,
J. A LIVINGSTON, } *Auditors.*

ASSETS.

Building	$11,000 00
Warehouse	720 00
Ground	2,500 00
Library	6,000 00
Specimens	1,200 00
Personal Property	450 00
	$21,870 00

LIABILITIES.

Mortgage	$ 3,411 00
Balance in favor of Institute	18,459 00
	$21,870 00

APPENDIX III.

DONATIONS AND EXCHANGES—BOOKS AND PAMPHLETS RECEIVED FROM APRIL 1ST, 1884, TO APRIL 1ST, 1885.

Canadian	110
United States	200
Great Britain and Ireland	160
India and other British Colonies, exclusive of Canada,	80
Foreign	180
Total	730

The number of Societies with which the Institute exchanges 160

APPENDIX IV.

THE NUMBER OF BOOKS AND PERIODICALS ISSUED TO MEMBERS.

From April 1st, 1884, to April 1st, 1885.............. 1,533

APPENDIX V.

List of Periodicals Subscribed for is the same as last year.

APPENDIX VI.

PERIODICALS PRESENTED TO THE INSTITUTE AND THE NAMES OF THE DONORS.

Das Echo	W. H. VanderSmissen, Esq., M.A.
Spectator	Prof. Hutton
Le Courrier de l'Europe	George E. Shaw, Esq., B.A.

On motion by Mr. Alan MacDougall, seconded by Mr. VanderSmissen, the Report was adopted.

The Report of the Committee appointed to confer with a Committee of the Natural History Society was read, and on motion by Dr. Kennedy, seconded by Mr. MacDougall, was adopted.

On motion by Mr. Shaw, seconded by Mr. VanderSmissen, the Committee were instructed to carry out the details required by the Report.

The following were elected officers and members of Council for the ensuing year:

President—W. H. Ellis, M.A., M.B.
First Vice-President—George Murray, Esq.
Second Vice-President—George Kennedy, M.A., LL.D
Third Vice-President—E. A. Meredith, LL.D.
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Librarian—George E. Shaw, B.A.
Editor—Rev. Henry Scadding, D.D.
Curator—David Boyle, Esq.

Members of Council—Daniel Wilson, LL.D., Jas. Loudon, M.A., F.R.S.C., R. Ramsay Wright, M.A., B.Sc., Alan MacDougall, C.E., F.R.S.E., Alex. Marling, LL.B., P. H. Bryce, M.A., M.D.

On motion by Mr. J. A. Livingston, seconded by Mr. McCharles, the thanks of the Institute were tendered to the President, Office-bearers, and Council in recognition of their valuable services during the past year.

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OF

THE CANADIAN INSTITUTE,

TORONTO,

BEING A CONTINUATION OF "THE CANADIAN JOURNAL OF
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OF THE

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Prof. W. H, Ellis, M.A., M.B	1884–85, 1885–86

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PROCEEDINGS

OF

THE CANADIAN INSTITUTE,

SESSION 1885–'86.

FIRST MEETING.

The First Meeting of the Session 1885-'86, being an open meeting and Conversazione, was held on Saturday, 21st November, 1885, the President in the Chair.

The President delivered an address, in which he announced the union of The Natural History Society with the Canadian Institute. He was followed by Mr. Brodie, President of The Natural History Society.

Mr. David Boyle read the following paper, entitled

THE ARCHÆOLOGICAL OUTLOOK.

Mr. President, Ladies and Gentlemen :

I take it that the purpose of the Council in asking me to write this paper was rather that I should lay before you what the Institute has done and proposes to do by way of recording archæological data and forming a collection illustrative thereof, than to attempt anything like a disquisition on the subject in its widest sense.

Still, it may be well to understand clearly just where we stand at the outset, and perhaps I can scarcely do better than tell you wha in my opinion, the study of archæology is *not.*

It is not merely the collecting of arrow-points, tomahawks, pipeheads and pottery, at so much or at nothing apiece from farmers and other persons. It is not even the actual digging up of such objects from the last resting places of Indian braves, nor is it the knowledge of where the largest number of specimens may be found. To do and to know these things is little more than stepping upon the verge of the study, and to prosecute work of this kind it is only necessary to possess a mania for bric-a-brac, some persistence, and a little money.

Persons who so conduct the work are collectors, and collectors only, and it is extremely doubtful whether their services are always of unmixed good. In so far as they further the preservation of specimens which otherwise might be lost, they answer a useful purpose, but when these people (forgetful of "ne sutor ultra crepidam,") undertake to ransack, to spoliate, to desecrate the graves of the Indians, for the purpose of satisfying a craving for curiosities, then their labors are not to be commended.

It is true that archæology includes the collection of illustrative specimens—without these the study would be somewhat devoid of interest, and the Canadian Institute aims at the formation of as large and as choice a collection as it is possible to make.

But archæology can only be said to possess any genuine public interest in so far as it is a handmaid to its elder sister, history, and it is the purpose of the Institute so to prosecute its researches in this line that its records and specimens may be mutually instructive.

If we take the whole Dominion as a field, the magnitude of the undertaking is too great either for our Society or for any similar organization to entertain for a single moment, and when it is clearly understood how much is involved in the prosecution of the task, it may be doubted whether even our own Province is not more than we can hope to work to the best advantage. I have no hesitation in saying, for my own part, that I think it is, and as it is not improbable that every other member of the Institute is of the same opinion, the question naturally arises, Why, then, undertake so much? The reply is twofold, but brief: First, because hitherto absolutely nothing has been done methodically or scientifically; and second, because the opportunities for doing anything are rapidly passing away, thousands having already gone for ever.

As I have already stated, it is not enough that we collect specimens. It is required in the first place that we make as full and complete a record as possible of every spot in the Province that gives or has given any indication of having been in any way identified with the life-history of our aborigines, and that with these should be collated every passage in the narratives of our early travellers for the purpose of identifying, as nearly as possible, those localities that are most intimately associated with the historical exploration of the country. Every mound, every village site, every camping-ground, every battle-field, every burial-pit, and every place upon which has been conducted the manufacture of clay vessels, pipes, arrow-points, or other articles, should be accurately measured, sketched, thoroughly explored and fully described.

Here, I may take the opportunity to express my pleasure in the knowledge that Mr. Arthur Harvey, a gentleman most deeply read in Canadian historic lore, and who takes more than a warm interest in our project, agrees with me that all such places as those named should be declared public property, and be made inviolate to all bric-a-brackers and pot-hunters until examined by some competent person appointed for that purpose.

I am afraid, however, that although this proposition is theoretically sound, and agrees with what has been done in Great Britain for the preservation of historical monuments, there would be too many opportunities and too many temptations to set such an enactment at defiance in this country, for us to expect much assistance by means of any legislation having this object in view.

Reports of progress should be made from time to time, and if we could afford to imitate our American cousins in their issue of beautifully illustrated documents, we might, as a matter of course, expect to arouse a much livelier interest among the people than if we present them with what they will be likely to regard as something akin to parliamentary blue-books.

Besides all this, the preservation and proper display of the illustrative objects will prove a matter of no small importance. These must be arranged in suitable cases and be properly classified for the purpose of comparing one with the other.

This, ladies and gentlemen, is, in brief, something like what we ought to do, or like what ought to be done, through one agency or another.

As already mentioned, the Canadian Institute has felt impelled to take action simply for the reason that no other organization or party seemed to evince any similar desire.

To prosecute the work in the way it should be prosecuted would necessitate the expenditure of from $5,000 to $6,000 annually for four or five years, and twice either of these sums might be employed to good advantage.

In April of the current year we issued a circular asking for information relative to this subject, in response to which many letters have been received, some expressive of sympathy with the project, some giving information regarding specimens, some promising assistance, and others extending hearty invitations to explore in promising localities.

In accepting one of these invitations from the Rev. T. T. Johnstone of Ancaster, I went, accompanied by Messrs. James Bain and Arthur Cox, F.R.S.A., to that township, which, from an aboriginal point of view, may almost be called *classic*—the township of Beverley. Here we collected a number of valuable relics, but owing to the ground having been seeded down we were unable to do more than examine the surface. Mr. Cox kindly sketched, on the spot, two of the most interesting localities, and I have been peculiarly fortunate in securing the services of an artistic friend to enlarge Mr. Cox's sketches for our use this evening, and I am sure you will agree with me that for the purpose in view the work has been admirably done.

On the farm of Mr. James Rae we were taken over a field of about five acres from which there have been collected since the time it was cleared no fewer than 200 iron tomahawks. Of course these are of European manufacture, but are of the type used by the early French and British occupiers to befool the red man in exchange for his peltries, or, it may be, simply for liberty to traverse the country unmolested.

In proof of the statement made by Mr. Rae regarding the number of tomahawks turned up here, we found by actual count more than 70 of these uncouth but murderous looking weapons mounted picturesquely along the top of the pickets forming one side of his garden fence. Under the stump of a tree in the field referred to, we unearthed several pieces of pottery, and as the tree itself (judging from an examination of the stump), must have been at least 150 years old, we have an approximation to a date which would correspond very closely with the appearance of the French in these western wilds. Why the tomahawks were left upon the ground by their possessors, is just one of these problems which, if capable of solution at all, we may hope to solve only by the aid of the cognate studies, history and archæology. The settlers in the neighborhood appear to have theorized a good deal about the question, the opinions, so far as we could gather, being pretty evenly divided between a great battle and a great epidemic.

What adds to the mystery is that only the other day I had a communication from a gentleman who formerly lived in the same township, and who informed me that within a few miles of the locality in question he had found, when clearing his farm, the most indubitable evidences of a formerly existing palisaded village upon the site of which he had picked up at least 300 of these iron tomahawks. It would be interesting to compare the weapons found on each place if only for the purpose of discovering whether they are of the same manufacture—both French, or, English and French respectively.

Three miles from Mr. Rae's farm we were driven to that of Mr. James Dwyer, where we were told there was an extensive ossuary. This was pointed out to us by Mr. Dwyer almost on the crest of a hill, forming the highest ground in the neighborhood for many miles all round, and within a few rods of the farm buildings. We found the dimensions of the pit, so far as could be ascertained by surface indications, to be about 25 feet in length and nearly half as wide. For the reason already assigned no examination could be made, but I visited the same place again this fall, my friend, the Rev. Mr. Johnstone, being also present, he having engaged the services of four stout men to handle spades and shovels. Nearly twice as many more hands came as volunteers, and in the course of the day we succeeded in exhuming a large number of valuable relics, including an almost perfect clay cup, four perfect clay pipes, a small, neatly-carved human head in stone, about one thousand pieces of white wampum, and many other specimens, all of which are on exhibition here this evening.

I should not omit to mention that at the foot and in the rear of the hill on which this burial-pit or ossuary is situated there is a large piece of freestone which has evidently been used by the Indians for grinding and polishing purposes. The proprietor has promised to present it to our museum.*

For other valuable contributions we are indebted to the generosity of Mr. Baldwin Jackes, Druggist, 351 Yonge street, Mr. Andrew Elvins, Tailor, Arcade, Mr. Loughead, of the township of Sunnidale, and to the York Pioneers. This Society has just made the Institute custodian of a good collection of several hundreds of specimens, and now the demand is for cases in which to preserve all that is in our possession.

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* Since presented to us.

Although we have to deplore that no records have been kept of numerous historic sites, the very traces of which have become wholly obliterated by the plough and otherwise, it is not yet too late to do *something*. From the letters I have received during the summer, it appears that there are still many localities that it would be of immense importance to explore before either the farmer or the curiosity-man thinks it desirable, for his own purposes, to begin the work of levelling or burrowing.

A recent communication to the *Mail* points out that in the valley of the Rainy River there is a series of mounds, few of which have as yet been disturbed. The writer, Mr. Chas. N. Bell, of Winnipeg, urges the expediency of having these scientifically treated with all convenient promptitude, but the probability is that nothing will be done until Tom, Dick and Harry, with all their relatives, have so disfigured the landscape and despoiled the deposits as to render any intelligent examination an impossibility.

To my mind these monuments, forming, as in all likelihood they do, the very outposts of the territory occupied by the Mound Builders, possess more than ordinary interest. We know their southern limit and their central range, and who can say that the exploration of those in the extreme north may not prove, like a third term in proportion, what is a necessity, by way of enabling us to arrive at a solution of the problem—the problem in this case being: Who were the people that erected these immense earth heaps, and did they move from the north southwards or *vice versa*?

At the very least we should have a survey made of these ancient works, with ground-plans, perspective drawings, and accurate descriptions.

Near St. Thomas there is said to be another mound, and I have no doubt, if I may judge from letters in my possession, that there are several other similar structures in various parts of the country. So far as private collections are concerned we have reason to be thankful that a few good ones exist, and it is not improbable that *some* of them at any rate may be secured for a provincial museum as soon as it is within our power to purchase.

To conclude, ladies and gentlemen, let me repeat that the work to be done is of such magnitude that without a considerable expenditure of time and money it will be quite out of the question to perform it in anything like a thorough or satisfactory manner. It should be either aided or wholly executed by the Dominion or Provincial Government. There can be no doubt that under the auspices of the former there would be immense and peculiarly advantageous opportunities, but in that case the collection formed would centre at Ottawa, which can scarcely be pronounced the educational or literary capital of the Dominion.

We shall hail with delight any efforts made towards the prosecution of archæological research, from a really national standpoint, but when we regard our own Province (and so regard it we must) as the most important of these colonies, and when we recognize the even more apparent fact that Toronto is the principal literary and scientific city in the Province, if not in the whole confederation, we naturally and quite unselfishly desire to see the outcome of public effort placed where it will do the most good.

But quite independent of any Dominion scheme that may or may not be consummated, Ontario owes it to herself as the richest, most populous, and most advanced Province, to work her own territory to the best advantage in this respect, and to form an archæological museum in the City of Toronto—the Queen City—the City of Schools—that will not only redound to our credit as an intelligent people, but that will attract students from distant lands, and enable the scientific investigator of the future to thank heaven for the somewhat tardy foresight that has provided for him, (figuratively speaking) a feast of fat things.

SECOND MEETING.

The Second Meeting was held on Saturday, 28th November, 1885, the President in the Chair.

It was moved by Dr. E. A. Meredith, seconded by Dr. George Kennedy,

"That the members of the Canadian Institute cannot allow this, their first meeting since the death of John Milne Buchan, M.A., to pass without placing on record the expression of their deep regret at the loss which the Society has sustained in his removal from amongst them, in the prime of life, and when, apparently, he had before him many years of honorable and useful work. They gratefully remember the marked progress which the Institute made during the two years of his Presidency, the earnest and active interest which he took in all its proceedings, and the kindliness and sympathy which characterized all his relations with his fellow-workers in the Institute. They desire also to express their sincere and heartfelt sympathy with Mr. Buchan's widow and family, in their great and sudden bereavement."

The President, in declaring the motion carried, expressed his deep sense of the loss which had befallen the Institute, and his personal sympathy with the words of the resolution.

The following list of donations and exchanges received since the annual meeting was read :

I.—CANADIAN.

1. Valuation Tables at Compound Interest, by Walter S. Andrews. (From the author.)
2. Monthly Weather Review, Dominion of Canada, April, May, June, July, August, September and October, 1885—7 Nos.
3. Proceedings and Transactions of the Nova Scotia Institute of Natural Science, Vol. VI., Part II., 1883-84.
4. Proceedings and Transactions of the Royal Society of Canada, Vol. II., 1884.
5. The Canadian Entomologist, Vol. XVII., Nos. 4, 5, 6, 7, 8, 9, 10—7 Nos.
6. The Canadian Practitioner, Vol. X., Nos. 6, 7, 8, 9, 10, 11, June—Nov., 1885—6 Nos.
7. Monthly Health Bulletin of Ontario, for March and April, May, July, 1885—3 Nos.
8. Geological and Natural History Survey of Canada :
    (1) Report of Progress for 1882-83-84.
    (2) Maps to accompany the above Report—4.
    (3) Ten Sheets Geological Map of New Brunswick, Quebec and Prince Edward Island.
    (4) Twenty-four Sheets Geological Map of Cape Breton.
9. The Extinct Cuttle-Fish of the Canadian North-West, by A. McCharles.
10. Statutes of Ontario, 48th Victoria, 1885.
11. In Memoriam—George Etienne Cartier. Presented by the author. G. W. Wicksteed, Esq., through Dr. E. A. Meredith.
12. Number and Nature of the Vowel Sounds, by M. L. Rouse, Esq.
13. The Canadian Record of Science, Vol. I., Nos. 3 and 4.

14. Fifteenth Annual Report of the Entomological Society of Ontario.
15. Collections of the Nova Scotia Historical Society, Vol. IV., 1884.
16. Ancient Rock Inscriptions on the Lake of the Woods, by A. C. Lawson, M.A.
17. Le Naturaliste Canadien, Vol. XV., Nos. 1, 3, 4, 5.
18. Sessional Papers relating to the Canadian Pacific Railway, 1882–83.
19. Toronto Water Works—Annual Report of the City Engineer and Manager for 1883-84.
20. The Innervation of the Heart of the Slido Terrapin (Pseudemys Rugosa) by T. Wesley Mills, M.A.
21. The Secretion of Oxalic Acid in the Dog under a varying diet, by the same.
22. Memorial Volume—Toronto Past and Present, 1834—1884. From the Mayor and Corporation.
23. Catalogue of Books presented to the Toronto Public Library by John Hallam. Esq. From the Public Library Board.
24. Annual Report of the Bureau of Industries, Province of Ontario, 1884, by Mr. A. Blue.

Total Canadian, 48 numbers and 38 maps.

II.—UNITED STATES EXCHANGES.

1. The School of Mines Quarterly, Columbia College, New York.
   Vol. III., Nos. 2, 3, 4.
   " IV., " 2, 3, 4.
   " V., " 1, 2, 3, 4.
   " VI., " 1, 2, 3, 4.
   " VII., No. 1.
2. The American Journal of Science, for May, June, July, August, Sept., Oct., Nov , 1885.
3. Science, Vol. V , Nos. 118, 119, 120, 121, 122, 123, 124, 125. Vol. VI., Nos. 126—146, 147.
4. Journal of the New York Microscopical Society, Vol. I., Nos. 4—7.
5. Proceedings of the American Academy of Natural Sciences of Philadelphia, Parts I. and II., 1885.
6. Memoirs of the Boston Society of Natural History, Vol. III., No. XI.
7. Proceedings of the Boston Society of Natural History, Vol. XXIII., Part I.
8. From the U. S. Geological Survey :
   (1) The Copper-Bearing Rocks of Lake Superior, by Prof. R. D. Irving.
   (2) Third Annual Report of the U. S. Geological Survey, 1881-82, by the Director, J. W. Powell.
   (3) Geology of the Comstock Lode and the Washoe District, by George F. Becker.
   (4) Atlas to accompany the same.
   (5) Contributions to the Knowledge of the Older Mesozoic Flora of Virginia, by William Morris Fontaine.
   (6) Silver-Lead Deposits of Eureka, Nevada, by Joseph Story Curtis.

(7) Palaeontology of the Eureka District, by Charles Doolittle Walcott.

(8) Fourth Annual Report of the U. S. Geological Survey, 1882–83.

9. Harvard University Bulletin, Vol. IV., Nos. 31 and 32.

10. The Pennsylvania Magazine of History and Biography, Vol. IX., Nos. 1, 2, 3.

11. Proceedings of the Worcester Society of Antiquity, Nos. XXI. and XXII.

12. Annals of the New York Academy of Sciences, Vol. III., Nos. 5—8. (3)

13. (1) Historical Collections of the Essex Institute, Vol. XXI., Nos. 7—12 ; Vol. XXII., Nos. 1—3. (3)

(2) Bulletin of the Essex Institute, Vol. XVII., Nos. 1—3.

14. Catalogue of the Library of the Peabody Institute of the City of Baltimore, Part II., D.—G.

15. Journal of Speculative Philosophy, Vol. XVIII., No. 4 ; Vol. XIX., Nos. 1, 2.

16. Journal of the Franklin Institute, for June, July, August, Sept., Oct., Nov., 1885.

17. Bulletin of the Brockville Society of Natural History, No. 1.

18. (1) First Biennial Report of the Secretary of the State Board of Agriculture of the State of Michigan, from Sept. 1st, 1880, to Sept. 30, 1882.

(2) Twenty-second Annual Report of the same from Oct. 1st, 1882, to Sept. 30, 1883.

19. Transactions of the American Society of Civil Engineers, April, May, June, July, and August, Sept., Oct., 1885.

20. Eighteenth Annual Report of the Peabody Institute, of the City of Baltimore.

21. Appleton's Literary Bulletin, Vol. IV., May to October—3 Nos.

22. Proceedings of the Newport Natural History Society for 1883 and 1884–85. (2)

23. Diary of David Zeisberger, Trans., by Eugene F. Bliss, 2 Vols. (From the Historical and Philosophical Society of Ohio.)

24. Compendium of the Tenth Census of the United States, 2 Vols., Parts I. and II., (June 1st, 1880.) From the Hon. the Secretary of the Interior, Washington, D. C.

25. Transactions of the Connecticut Academy of Arts and Sciences, Vol. VI., Part 2.

26. Bulletin of the Museum of Comparative Zoölogy at Harvard College, Vol. XI., No. 11 ; Vol. XII., No. 1.

27. The International Standard, July, 1885.

28. Transactions of the Sixteenth and Seventeenth Annual Meetings of the Kansas Academy of Science, 1883-84, Vol. IX.

29. The Geological and Natural History Survey of Minnesota, 1872—1882, Vol. I. Geology, by N. H. Winchel, assisted by Warren Upham.

30. Bulletin of the Minnesota Academy of Natural Sciences, 1880–82, Vol. II., No. 5.

31. (1) Bulletin of the Illinois State Laboratory of Natural History, Vol. II., Article III., Part I.

(2) Description of New Illinois Fishes, by S. A. Forbes.

(3) Fourteenth Report of the State Entomologist of the Noxious and Beneficial Insects of the State of Illinois. S. A. Forbes. 1884.

32. Proceedings of the American Antiquarian Society, N. S. Vol. III., Part 4.
33. Bulletin of the Sedalia Natural History Society, No. 1. (August, 1885.)
34. (1) The Public Domains, with Statistics, U. S. A.
    (2) Land Laws of the United States, Local and Temporary, 2 Vols.
    (3) Existing Land Laws. (From the Hon. the Secretary of the Interior, Washington, D. C.
35. (1) Smithsonian Report for 1876.
    (2) Smithsonian Contributions to Knowledge, Vol. XXIV. and XXV.
36. Historical Fallacies regarding Colonial New York. (From the Oneida Historical Society.
37. (1) Proceedings of the Rhode Island Historical Society, 1883–84 ; 1884–85.
    (2) Same, New England Almanac, by Amos Perry. (Providence.)
38. From the Bureau of Steam Engineering, Navy Department, Washington, D. C. :
    (1) Extract from Annual Report of the Chief of Bureau of Steam Engineering, 1869.
    (2) Report made to the Bureau, Nov. 5, 1880.
    (3) " " " Aug. 9, 1882.
    (4) " " " March 3, 1883.
    (5) " " " April 6, 1883.
    (6) Annual Report for 1884.
39. Bulletin of the American Museum of Natural History, Central Park, New York, Vol. I., No. 6.
40. Johns Hopkins University Circulars, Vol. IV., 42 ; Vol. V., 43, 44.
41. Magazine of American History, Nov. and Dec., 1885.
42. Proceedings and Collections of the Wyoming Historical and Geological Society, Vol. II., Part 1.
43. Journal of the Cincinnati Society of Natural History :
    Vol. III., Nos. 1, 3, 4.
    " IV., V., VI., VII.
    " VIII., Nos. 1, 2, 3.
44. Bulletin of the American Geographical Society, 1885, No. 1.
45. Proceedings of the American Association for the Advancement of Science :
    Vol. 31, Parts 1, 2 ; Vol. 32.
    " 33, " 1, 2, 1882–83–84.
46. Abstract of Proceedings of the New York Academy of Anthropology for 1884.
47. Intimate Connection between Gravitation and the Solar Parallax, by Thomas Bassnett. (Per Mr. M. L Rouse.)
48. Transactions of the Kansas State Historical Society, Vols. I. and II.
49. Proceedings of the Colorado Scientific Society, Vol. 1.—1883 and 1884.
50. From the Georgia Historical Society :
    (1) Reply to Resolution of Georgia Historical Society, by Rt. Rev. Stephen Elliott—Feb. 12, 1866.
    (2) Eulogy of Rt. Rev. Stephen Elliott—1867.
    (3) Reminiscences of Service with the First Volunteer Regiment of Georgia, in Charleston Harbour—1863.

(4) & (5) Constitution and By-Laws of Georgia Historical Society—1871; ditto, 1883.
(6) Wilde's Summer Rose, by A. Barclay—1871.
(7) In Memoriam—Edward Jenkins Harden—1873.
(8) Dedication of Hodgson Hall, Feb. 14, 1876.
(9) Sergeant William Jasper, Jan. 3, 1876.
(10) The Georgia Historical Society—Fits oundertrno,andaPs Friends, Feb. 14, 1881.
(11) A Suggestion to the Origin of the Plan of Savannah. Sept. 7, 1885.

51. The American Naturalist, Vol. XIX., No. 11, for Nov., 1885. (From the publishers.)
52. The Library of Cornell University, Vol. I., No. 12.
Special Lists—No. I. Mathematics.

Total United States, 189 numbers.

III.—GREAT BRITAIN AND IRELAND.

1. (1) Minutes and Proceedings of the Institution of Civil Engineers, Vols. LXXIX., LXXX., LXXXI., LXXXII.
   (2) Charter By-Laws and List of Members of the Institution of Civil Engineers, June 3, 1885.
   (3) Heat and its Mechanical Applications. Lectures, I. C. E., 1883-84.
   (4) Brief Subject—Index.—I. C. E. Vol. LIX. to LXXXII.; Sessions 1879-80 to 1884-85.
2. Journal of the Transactions of the Victoria Institute, Vol. XVIII., No. 72; Vol. XIX., Nos. 73, 74.
3. (1) Report and Transactions of the Birmingham Natural History and Microscopical Society, for 1883.
   (2) The Midland Naturalist, (N.S.) Vol. VII., Nos. 73—84; Jan.—Dec., 1884; Vol. VIII., Nos. 85—95; Jan.—Nov., 1885.
   (3) Report and Transactions of the Birmingham Natural History and Microscopical Society, Nos. 3, 4, 5, for 1880, 1881, 1882.
4. Archæologia Aeliana, Part 29, Vol. X., No. 3; Part 30, Vol. XI., No. 1.
5. Monthly Notices of the Royal Astronomical Society, Vol. XLV., Nos. 6, 7, 8, 9.
6. Proceedings of the Royal Geographical Society, (N.S.) Vol. VII., Nos. 5, 6, 7, 8, 9, 10, 11. May to Nov., 1885.
7. Transactions and Proceedings of the Botanical Society of Edinburgh, Vol. XVI., Part 1.
8. Journal of the Anthropological Institute of Great Britain and Ireland, Vol. XIV., No. 4; Vol. XV., Nos. 1, 2.
9. Trübner's American, European and Oriental Literary Record, Nos. 209—212, 215—216.
10. Journal of the Linnean Society of London:
    (1) Botany, Vols. XX. and XXI., Nos. 130—137.
    (2) Zoölogy, " XVIII. and XIX., Nos. 101—108.
    (3) Proceedings of the Linnean Society of London. March—Oct., 1883.
    (4) List of the Linnean Society of London, 1883, 1884, 1885.
11. Proceedings of the Royal Colonial Institute, Vol. 16, 1884-85.
12. Journal of the Royal Microscopical Society, Ser. II., Vol. V., Pts. 3, 4, 5.

13. (1) Proceedings of the Cambridge Philosophical Society, Vol. V., Parts 1, 2, 3.
 (2) Transactions of the Cambridge Philosophical Society, Vol. XIV., Part 1.

14. (1) Proceedings of the Royal Society of Edinburgh, Vols. XI. and XII., 1881—83.
 (2) Transactions of the Royal Society of Edinburgh, Vol. XXX., Parts 2 and 3; Vol. XXXII., Part 1.

15. Transactions of the Manchester Geological Society, Vol. XVIII., Parts 8, 9, 10.

16. Quaritch's Catalogues, Nos. 362, 363, 364.

17. Proceedings of the London Mathematical Society, Nos. 237—249.

18. Journal of the Quekett Microscopical Club, Ser. II., Vol. II., Nos. 12, 13.

19. Ocean and Air Currents, by Thomas D. Smellie.

20. Proceedings of the Royal Physical Society of Edinburgh:

Vol. I., Part 2. (1856-58.)
" IV., Parts 1, 2, 3. (1874-78.)
" V., Part I. (1878-79.)
" VI., (1880-81.)

21. Proceedings of the Somersetshire Archæological and Natural History Society for 1884, (N.S.) Vol. X.

22. Annual Report of the Leeds Philosophical and Literary Society for 1884-85.

23. Proceedings of the Society of Antiquaries of Scotland, Vol. VI., (N. S.)

24. Proceedings of the Philosophical Society of Glasgow:

Vol. XVI. and Vol. II., Parts 1—4.
" III., " 1—6.
" IV., " 1, 2.
" IX., " 1, 2.
" XI., " 2.
" XIII., " 1.
" XV.

25. Transactions of the Edinburgh Geological Society, Vol. IV., Part III.; Vol. V., Part 1.

26. Proceedings of the Royal Society, Vols. XXXVI.—XXXVIII., Nos. 228—238.

27. (1) Scientific Proceedings of the Royal Dublin Society, Vol. IV. (N. S.) Parts 5 and 6.
 (2) Scientific Transactions of the Royal Dublin Society, Vol. III. (Series II.) Parts 4, 5, 6.

28. (1) Transactions of the Geological Society of Glasgow:

Vol. I., Parts 1, 2.
" II., " 2, 3.
" III., " 1, 2.
" IV., " 2, 3.
Vol. V., Part 1.
Vols. VI. and VII, 1876—'84.
Palæontological Series, Part I.

 (2) Catalogue of the Western Scottish Fossils.

29. Proceedings of the Cambridge Philosophical Society, Vol. X.—XI., 1885.
30. The Scottish Geographical Magazine, Vol. I., No. 4—11, April to Nov., 1885.
31. Palestine Exploration Fund—Quarterly Statement—Jan., April, July and Oct., 1885.

Total Great Britain and Ireland, 178 numbers.

IV.—BRITISH COLONIES, (EXCLUSIVE OF CANADA.)

1. (1) Proceedings of the Asiatic Society of Bengal, No. XI., Dec., 1884; No. I.—V., Jan.—May, 1885.
   (2) Journal of the Asiatic Society of Bengal, (N.S.) Vol. LIII., Part 1, Special Number.
   Part II., No. III., 1884.
   Vol. LIV., Part I., Nos. 1 and 2, 1885.
2. Papers and Proceedings of the Royal Society of Tasmania, for 1883 and 1884.
3. (1) Memoirs of the Geological Survey of India.
   Palæontologia Indica:
   Series IV., Vol. I., Part 4.
   " X., " III., Parts 4, 5 and 6.
   " XIV., " I 3, Part 4.
   (2) Records of the Geological Survey of India, Vol. XVIII,, Parts 2 and 3, '85.
4. Transactions and Proceedings of the New Zealand Institute, Vol. XVII., 1884.
5. Journal and Proceedings of the Royal Society of New South Wales, for 1883, Vol. XVII.
6. Proceedings of the Royal Society of Queensland, Vol. I., Parts 1—4, 1884–85.

Total British Colonies, 23 numbers.

V.—FOREIGN EXCHANGES.

1. Bulletin de la Société d'Anthropologie de Paris, Tome Huitieme (III Série), Fascicules, 1, 2, 3, Janvier à Juillet, 1885.
2. Cosmos di Guido Cora, Vol. VIII., No. 1—7, 1884.
3. Mémoires et Compte Rendu des Travaux de la Société des Ingénieurs Civils, Novembre et Décembre, 1884; Janvier, Février, Avril, Mai et Juin, 1885.
4. Verhandlungen des Vereins für Naturwissenschaftliche Unterhaltung zu Hamburg, 1878—1882. Band V., 1883.
5. Bulletin de la Société Géologique de France:
   3 Série, Tome I., No. 1.
   " " III., " 3.
   " " IV., " 6.
   " " V., " 7.
   " " VII., " 3, 7, 8, 9, 10, 11.
   " " IX., " 7.
   " " XI., " 2.
   " " XII., " 2, 4, 5, 6, 9.
   " " XIII., " 3, 4, 5, 7.

6. Ymer Tidskrift Utgifven af Svenska Sällskapet för Anthropologi och Geografi, 1885. (Femte ärgängen, 2a, 3e, 4e, Häftet.)
7. Compte Rendu des Séances de la Société de Physique et d'Histoire Naturelle de Genève, 1884.
8. Atti della Società Toscana di Scienze Naturali, Processi Verbali, Vol. IV.
9. (1) Sitzungsberichte und Abhandlungen der Naturwissenschaften Gesellschaft, Isis in Dresden, 1884. Juli bis December.
   (2) Festschrift der Natur. Gesell. Isis, 14 Mai, 1885.
10. Abhandlungen vom Naturwissenschaftlichen Vereine zu Bremen :
    VIII., Band, 2 Heft.
    IX., " 1, 2, "
11. (1) Verhandlungen der K. K. Geologischen Reichsanstalt, 1884, Nr. 1 bis 18.
    (2) Jahrbuch der K. K. Geologischen Reichsanstalt, 1884, XXXIV. Band, 4 Heft; XXXV. Band, 1 Heft, 1885.
    (3) Verhandlungen, 1885, Nr. 1—7. (Wien.)
12. Bulletin de la Société Royale Belge de Géographie, 1884. Nos. 3, 4, 5, 6.
13. Nachrichten von der K. Gesellschaft der Wissenschaften und der Georg-Augusts Universität zu Göttingen, 1884. No. 1—13.
14. (1) Sitzungsberichte der mathematisch-physikalischen Classe der k. b. Akademie der Wissenschaften zu München, 1884, Hefte 1., II., III., IV.
    (2) Sitzungsberichte der philosophisch-philologischen und historischen Classe der k. b. Akademie der Wissen, zu München, 1884, Hefte I., II., III., IV., V., VI.
    (3) Gedachtnissrede auf Theodor L. W. von Bischoff.
    (4) Rudolph Agricola.
    (5) Franz von Kobell.
    (6) Almanach der k. b. Akademie der Wissen. zu München für 1884.
15. Annales des Mines, Huitiéme Série, Tome VII., 1, 2, 3, Livraisons de 1885.
16. Correspondenz-Blatt der deutschen Gesellschaft für Anthropologie, Ethnologie und Urgeschichte, XVI. Jahrgang, Nr. 4, 5, 6, 7, 8, 9. April bis September, 1885.
17. Mittheilungen der deutschen Gesellschaft für Natur. und Volkerkunde Oestasiens 32, 33, Hefte Mai, u. August, 1885.
18. Acta Universitatis Lundensis, Tome XIX. to XX., 1882-83, 1883-84.
    (1) Theologi.
    (2) Philosophi, Språkvetenskap och Historia.
    (3) Rätts och Statsvetenskap.
    (4) Mathematik och Naturvetenskap. (8 numbers.)
    (5) Lunds Universitets—Bibliotek Accessions Katalog, 1884.
19. Le Globe, 4e Sèrie, Tome IV.
    Bulletin No. 2.
20. Boletin de la Academia Nacional de Ciencias en Córdoba. (Republica Argentina), Tomo VII., Entrega 4a.
21. Annaes da Escola de Minas de Ouro Preto, Nos. 1 and 2.
22. Sur la Valeur Morphologique de la Trompe d'Eustache par M. le Professeur Paul Albrecht, Bruxelles.
    Two other pamphlets by the same.

23. Schriften der physikalisch-ökonomischen Gesellschaft i Pr. fünfundzwanzigster Jahrgang, erste und Zweite Abtheilungen.
24. Verhandlungen der Berliner Gesellschaft für Anthropologie, Ethnologie, und Urgeschichte, Sitzungen, 12, 17 Januar, 21 Februar, 21 März, 18 April, 16 Mai.
25. Annuaire Gèologique Universel et Guide du Gèologique, 1885.
26. Forhandlinger i Videnskabs-Selskabet i Christiania, 1884.
27. Memoirs of the University of Tokio, No. 11. A System of Iron Railroad Bridges for Japan, by J. A. L. Waddell, C.E , in 2 Vols.
28. Publications de la Société d'Ethnographie, Paris.
29. Berichte über die Verhandlungen der Königlich Sächsischen Gesellschaft der Wissenschaften zu Leipzig, Mathematisch-Physische, Classe 1884 and 1885, I., II.
30. Bulletin de la Société Royale de Botanique de Belgique, Tome 24me. Fas. 1er, 1885.
31. Archivio per l'Antropologia e la Etnologia, Quindicesimo Volume. Fas. Primo, Firenze.
32. Magnetische und Meteorologische Beobachtungen an der K. K. Sternwarte zu Prag, 1884. 45 Jahrgang.
33. Archives Néerlandaises des Sciences Exactes et Naturelles. Tome XIX. Nos. 3, 4, 5 ; Tome XX., 1, 2.
34. Verhandlungen der K. K. zoologisch-botanischen Gesellschaft in Wien, XXXIV. u. XXXV., Bände.
35. Anales del Museo Nacional de México, Tomo III., Entrega 7*a*, 1885.
36. Bijdragen tot de Dierkunde, Nos. 10, 11, 12, from La Société Royale de Zoologie "Natura Artis Magistra."
37. Mittheilungen der k. k. Geographischen Gesellschaft in Wien, XXXVII. Band.
38. Bulletin de la Société Royale Belge de Géographie Nos. 4, 5, 6, 1884. Juillet-Octobre.
39. Bulletin de l'Académie Royale de Copenhague, 1884, Nos. 2, 3 ; 1885, No. 1.
40. 24 und 25 Bericht über die Thätigkeit des Offenbacher Vereins für Naturkunde, vom 4. Mai, 1882, bis 11 Mai, 1884.
41. (1) Jaarboek van de K. Akademie van Wetenschappen, 1883.
    (2) Verslagen en Mededeelingen der K. Akademie van Wetenschappen, Deel XIX. Stuk 1, 2, 3.
    (3) Naam en Zaakredgister of de Verslagen en Mededeelingen. Deel 1—XX.
42. (1) Kongliga Svenska Vetenskaps-Akademiens Handlingar, 3 Vols., Bd. 18, 19-1-d 2, 1880-1881.
    (2) Bihang Bd. 6. 1, 2 ; 7 : 1, 2 ; 8 : 1, 2 ; 1880—1883. 6 Vols.
    (3) Ofversigt af K. Vetenskaps Akademiens Forhandlingar, 38, 39, 40.
    (4) Lefnadsteckningar 5, Band 2, Häfte 2.
    (5) Beskyddare, 1882, 1883, 1884.
43. (1) Sitzungsberichte der k. k. Gesellschaft der Wissenschaften zu Prag, 1882, 1883, 1884.
    (2) Kalousek Geschichte, I.
    (3) Studnicka Bericht, I.
    (4) Generalregister, 1874—1884.
    (5) Verzeichniss der Mitglieder.

44. Arbók hins Islenza Fornleifafélags, 1884–85, Reykjavik.
45. Yahrbücher der K. K. Central Anstalt für Meteorologie und Erdmagnetismus, Wien, 1883. XX. Band.
46. Bullettino della Sezione Fiorentina della Societá Africana d'Italia, Volume I., Fascicoli 1, 2, 3, 4.

Total Foreign, 207 numbers.

Summary Compared with the Number Received During the Same Period of Last Year.

	1884.	1885.
Canadian	36	48 and 38 maps.
United States	75	189
Great Britain and Ireland	63	178
British Colonies, exclusive of Canada	20	23
Foreign	93	207
Total	287	645
Increase		358

The following were elected members:—F. T. Shutt, B.A., J. H. Cameron, B.A., J. H. McGeary, B.A., Edward Farrar, Esq., W. S. Andrews, Esq., Dion C. Sullivan, LL.B., G. A. Dickson, M.A.

The President presented the following paper, by Professor Hutton, entitled

CLASSICAL NOTES.

In Demosthenes' first speech against Aphobus occur the following words (815):

"*εἰς γὰρ τὴν συμμορίαν ὑπὲρ ἐμοῦ συνετάξαντο κατὰ τὰς πέντε καὶ εἴκοσι μνᾶς πεντακοσίας δραχμὰς εἰσφέρειν.*"

Compare the second speech, 836, 837, 838 ·

"*ἡγεμόνα με τῆς συμμοριάς καταστήσας οὐκ ἐπὶ μικροῖς τιμήμασιν ἀλλ' ἐπὶ τηλικούτοις ὥστε κατὰ τὰς πέντε καὶ εἴκοσι μνᾶς πεντακοσίας εἰσφέρειν . . . . οὐδὲ ταῦτα ἀποφαίνοντες ἐξ ὧν τιμησάμενοι τὰς εἰσφορὰς εἰσεφέρετε . . . . . ἀλλὰ μὴν ἔκ γε τῆς οἰκίας καὶ τῶν τεττάρων καὶ δέκα ἀνδραπόδων καὶ τῶν τριάκοντα μνῶν τὴν εἰσφορὰν οὐχ οἷόν τε γενέσθαι τοσαύτην, ὅσην ὑμεῖς συνετάξασθε πρὸς τὴν συμμορίαν.*"

In all these passages *εἰσφορὰ* and *εἰσφέρειν* mean *not* a special property tax and the payment of such, which is their usual meaning, but the taxable value of property and the return of such to the commissioners. "They agreed to return as taxable 500 drachmæ (or five minæ) for every twenty-five minæ": *i. e.*, they agreed to return the property as taxable upon one-fifth of its amount, *i. e.*, as belonging to the first class.

The five hundred drachmæ therefore is not the amount paid, but the amount returned as taxable out of every twenty-five minæ: the amount actually paid out of every twenty-five minæ would be, of course, a fraction much smaller than this one-fifth: (probably not more, as a general thing, than five per cent. on this fifth, or one per cent. on the whole. See Kennedy's Demosthenes, Vol. I., Appendix 4, p. 309, note).

These passages are fully explained by Boeckh (Public Economy of Athens, Vol. II., pp. 285–288, and again 316). Schaefer, however, reduces them to nonsense by taking *εἰσφέρειν* in its ordinary sense, of paying a property tax. Kennedy, of course, translates correctly; but he does not notice the difficulty. The school edition of Penrose is correct, and gives the reference to Boeckh; but, unless its readers turn up Boeckh for themselves, they will not find that the force which Demosthenes attaches to *εἰσφέρειν* and *εἰσφορὰ* here is merely anomalous, and due apparently to carelessness and the desire for brevity. Liddell and Scott (the last edition included) have missed these passages, and recognize the two words only in their ordinary sense.

Plato, Republic IX., chap. 9, 583 B.

> "*ταῦτα μὲν τοίνυν οὕτω δύ' ἐφεξῆς ἂν εἴη καὶ δὶς νενικηκὼς ὁ δίκαιος τὸν ἄδικον· τὸ δὲ τρίτον ὀλυμπικῶς τῷ σωτῆρί τε καὶ τῷ 'Ολυμπίῳ Διὶ ἄθρει ὅτι καὶ κ.τ.λ.*"

The common explanation of this passage in Stallbaum and Bekker is satisfactory enough. The first libation at the Greek banquet was to Olympian Zeus; the second to the heroes or to Earth; the third to Zeus the Saviour. But the champion at Olympia would naturally couple with his last libation the double title of Zeus—the Olympian no less than the Saviour—for the omen's sake.

In the same way for Plato's just man, who is compared to an athlete of Olympia contending in three contests against his rival, the third libation poured by his friends is poured to Olympian Zeus.

To the references given in Stallbaum and Bekker it is worth while to add a very close parallel which they have overlooked. In

Pindar's fifth Isthmian ode (the sixth according to the other arrangement) occurs an exact counterpart:

> "*εἴη δὲ τρίτον*
> *σωτῆρι πορσαίνοντας 'Ολυμπίῳ Αἴγιναν κάτα*
> *σπένδειν μελιφθόγγοις ἀοιδαῖς.*" (10-12).

"May it be mine to offer a third bowl to Olympian Zeus the Saviour, and pour over the land of Ægina a libation of honey-sweet song."

Pindar has sung one ode (Nem. V.) for one member of his hero's family; and this is the second and celebrates an Isthmian victory. There remains therefore yet to be won victory at Olympia. Accordingly the poet prays that it may be his lot to pour a third libation-ode, in honour of Zeus, "Saviour and Olympian." "Saviour" because to Zeus by this title the third libation is poured. "Olympian" because the victory which he hopes to celebrate is to be won at Olympia.

NOTES ON JUVENAL AND HORACE

Juvenal, Sat. XIV., 281–283.

> Grande operae pretium est, ut tenso folle reverti
> Inde domum possis tumidaque superbus aluta
> Oceani monstra et juvenes vidisse marinos.

Such is the form in which this passage appears in the first edition of Mr. Mayor, and in the editions of Jahn, Heinrich, Ruperti, Häckermann, Stocker, and Lemaire; and in the second edition of Mr. Escott.

Of these editors the last two only have translated the passage: the former correctly, the latter, misled by the punctuation, quite wrongly. Lemaire paraphrases "operae pretium est vidisse . . . unde redeant," making *vidisse* depend on *operae pretium est.* Mr. Escott translates, "you have an ample reward *in that* you are able to return home with swelling purse," etc. The others pass by the passage in silence. In whatever sense they took it, their punctuation, at any rate, is indefensible.

Better is the punctuation of Achaintre's and of the Delphin edition, which place commas at *est*, *possis*, *aluta*, and *monstra*; and better still the text of Mr. Simcox, who punctuates at *est*, *possis*, and *aluta* only. But, even so, the construction is obscured by the punctuation; and the Delphin editor seems to have missed it: he paraphrases "magnum quid fecisse putas si dives redeas," and again, "si videas et redeas," as though *reverti* and *vidisse* were co-ordinate, and both dependent on *possis*. The punctuation of Mr. Macleane (a comma at *possis* only) seems to point yet more directly to this misunderstanding.

The true construction is obvious enough after a glance. The whole clause from *ut* to *aluta* is parenthetic and should stand by itself: *vidisse* is the subject of *operae pretium est*.

> Grande operae pretium est —— ut tenso folle reverti
> Inde domum possis tumidaque superbus aluta ——
> Oceani monstra et juvenes vidisse marinos.

"A precious reward this for all your trouble, to have faced the monsters of the deep and the mermen, and all for the sake of returning home with full purse and the pride of stuffed money-bags."

i. e. It is not worth your while to face the great leviathan for the sake of a full purse.

In his second edition Mr. Mayor has altered his punctuation correctly and introduced a comma at *aluta*; but his notes are still silent. Yet the fact that previous to this only one edition, and that the most modest of all, the school edition of Mr. Prior, had printed the passage correctly (Prior also added a correct translation), seems to show that a note is not unnecessary.

Horace, Epistle I., 1, lines 13–19.

> Ac ne forte roges quo me duce quo lare tuter,
> Nullius addictus jurare in verba magistri
> Quo me cunque rapit tempestas deferor hospes.
> Nunc agilis fio et mersor civilibus undis,
> Virtutis verae custos rigidusque satelles:
> Nunc in Aristippi furtim praecepta relabor
> Et mihi res non me rebus subjungere conor.

The difficulty of the passage lies in the last two lines. What is the connection between them? The most natural and, I believe, the correct interpretation makes the last an amplification of the line before, and a definition at once of "Aristippi praecepta," and of the Stoic creed contained in lines 16 and 17.

"At one time," says Horace, "I am all for action, and I plunge into the ocean of public life the guardian and stiff-necked champion of straight-laced righteousness; at another time I fall away unconsciously to Aristippus' maxims, and try to make the world serve me, instead of serving it."

That is to say, Horace is contrasting the Stoic, who is a missionary and lives not for himself but for the world, and who accordingly is a man of action and of affairs, with the Cyrenaic voluptuary, who sacrifices everything for himself, and who regulates his dealings with the world by the amount of pleasure to be extracted for himself therefrom. The latter also, if it so chance, will be a man of action and affairs; but if he is, it is only because he gets more enjoyment from the life of action than from the quietist's life. Like the Christian, but in a very different sense, the Cyrenaic is "in the world but not of it."

So understood the passage is coherent and simple. Unfortunately a good deal of misplaced ingenuity has been spent upon it till its simplicity has been obscured. Meineke and others even wished to transpose lines 19 and 17, and read:

> Et mihi res non me rebus subjungere conor
> Virtutis verae custos rigidusque satelles,
> Nunc in Aristippi, etc.,

while Dobree secured the same result awkwardly, though with less violence, by changing *non* to *nunc*. They could not understand how a Stoic, whose aim was to be independent of the world, could be said to submit himself to it. And even Orelli escapes the same conclusion only by denying that the last line contains any reference to Stoicism: the last line, he seems to say, is added to qualify and minimize the preceding. Horace proclaims himself a Cyrenaic, but hastens to add that, though he does not despise the good things of this world, he is yet no slave to them. Interpreted to refer to Stoicism, the last line is (he says) inconsistent with one of the articles of the Stoic creed: *οὐ δεῖ προσθήκην αὔτον τῶν ἐκτὸς γίγνεσθαι ἀλλ' ἐκεῖνα αὐτῷ προσθεῖναι* (Epict: 1, 4, 49). The inconsistency that Orelli sees here is imaginary. Epictetus is saying that the Stoic is not dependent upon worldly advantages or the creature of them: Horace is saying that the Stoic works for the world's good and not for his own pleasure; the two propositions are perfectly compatible. The only quotations concerning the Stoic creed which are to the point here are the well known—

> Non sibi sed toti genitos se credere mundo
> (Lucan 2, 383, quoted by Obbar.)
> Nec sibi tantum sed universis singulisque consulendum.
> (Seneca de clem.: 2, 5—Obbar.)

and "*πολιτεύεσθαι τὸν σοφόν.*"

But even Obbar, who has explained satisfactorily the significance of the last line, has introduced confusion into the passage by regarding the phrase *me rebus subjungere* as synonymous with the cardinal doctrine of the Stoic's ὁμολογουμένως τῇ φύσει ζῆν. This, as Orelli says, is far-fetched and unnatural. The φύσις referred to is primarily the abstract laws of life; on the other hand, "*rebus*" here seems to denote concrete human beings and human needs and interests. The connexion between the two exhortations is at the most by distant implication. The Greek exhortation means simply "Live according to nature," the Latin, "Live for others."

Finally, against the conjecture—

> "Nec mihi res sed me rebus," etc.

which has found favour at different times, a conclusive argument is supplied by the Cyrenaic phrase "ἔχω ἀλλ' οὐκ ἔχομαι," words which, though used by Aristippus in a special context, express happily, in a nutshell, his relation to all external advantages. (Diog. Laert: 2, 8, 75). Obbar furnishes another text scarcely less to the point (id. sect. 95) τὸν σοφὸν ἑαυτοῦ ἕνεκα πάντα πράξειν. Both quotations furnish a description of Cyrenaic practice precisely parallel to Horace's *et mihi res non me rebus subjungere conor*.

SPONTANEITY IN NATURE ACCORDING TO EPICURUS.

> Quare in seminibus quoque idem fateare necesse est,
> Esse aliam praeter plagas et pondera causam
> Motibus, unde haec est nobis innata potestas,
> De nilo quoniam fieri nil posse videmus.
> Pondus enim prohibet ne plagis omnia fiant
> Externa quasi vi: sed ne mens ipsa necessum
> Intestinum habeat cunctis in rebus agendis
> Et devicta quasi hoc cogatur ferre patique,
> Id facit exiguum clinamen principiorum
> Nec regione loci certa nec tempore certo.
>
> Lucretius II.: 284-293.

A considerable part of Mr. Masson's very interesting study of Lucretius' Atomic Theory * is taken up with an examination of this passage. M. Guyau † sees here the doctrine of free-will and contingency in matter; the reign of law in nature, therefore, so far from being a cardinal tenet of the Epicurean system is, according to him, expressly denied by Epicurus, or, to speak more correctly, limited: there are certain bounds beyond which no created thing can pass, but within these bounds it possesses a modified freedom and moves in this direction or in that, developes or degenerates. In the same spirit Mr. Benn* represents the Lucretian system as grasping only the negative side of natural law: Lucretius recognizes "the limiting possibilities of existence" rather than an omnipresent and unbending law: nature possesses only a right of veto, and is no longer the potter moulding passive clay.

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* The Atomic Theory of Lucretius, by John Masson, M.A., London.—George Bell & Sons, 1884.

† La Morale d'Epicure, par M. Guyau, 2me edit.—Paris: Librairie Germer Baillière et Cie, 1881.

Against all this Mr. Masson argues at length; he conceives the free-will of the Lucretian atoms to cease altogether in the world of inanimate nature, and also apparently in the brute creation: only in man is this free-will still operative. And Mr. Masson gives reasons why this conception is natural and easy:

(*a*) The free wills of the different atoms of matter, he says, would counteract each other.
(*b*) The force of gravity from within resists change.
(*c*) The pressure from without has the same effect.
(*d*) The atoms forming gross matter are in themselves heavier and slower of movement than others, and the gross matter they form is therefore of the same character.
(*e*) Finally M. Guyau's theory proves too much: it changes Epicurus into a Greek Hans Andersen, in whose creations the impulse of animism is supreme, and sticks and stones are conscious beings.

It is difficult to reconcile these arguments of Mr. Masson with other parts of his own book, with his quotations from M. Guyau, and with Lucretius.

Thus his first argument (*a*) is forcible enough, but it applies equally strongly to the Lucretian conception of free-will in man; and is no proof, therefore, that Lucretius denied free-will to nature. The difficulty seems to be analogous to that presented by the sense of personality: out of the various instincts derived from our common human nature and from our special parents rises yet a sense of a single personality.

(*b*) This is true, though in a less degree, of man also; and it should modify, but not destroy—on Lucretius' principles—the free-will of nature.

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* The Greek Philosophers, by Alfred William Benn.—London: Kegan Paul, 1882.

(*c* and *d*) These arguments also tend only to limit the extent of free-will that Lucretius can have attributed to nature: not to cast doubts on its existence.

(*e*) It is very difficult to understand how Mr. Masson can urge this objection. He has himself shown the similarity of Lucretius' (or, as he calls it, M. Guyau's) doctrine of spontaneity in nature to Schopenhauer's doctrine of will (p. 232), to Gassendi's doctrine of consciousness (p. 140), and to Professor Clifford's doctrine of mind-stuff (pp. 132 *seq.*); and we may add to the list the cognate theories of Zöllner (Lange's History of Materialism, vol. ii., p. 328), and of Czolbe (*id.*, p. 291), (comp. vol. i., p. 13, note). If these speculations are on a level, in respect of truth, with Andersen's fairy tales, then the same may be said of M. Guyau; not otherwise. No doubt there is a resemblance up to a point, but the question of degree is everything.

According to M. Guyau, Lucretius conceives that in nature as in man each thing has, so to speak, its tether (*foedera naturae, fati fines*, *foedera fati*, Lucretius V. 309-310, II. 254); when it has reached the end of its tether it stops necessarily; and practically, as with man, it stops short of this. This *finita potestas*, as Lucretius calls it (I., 76, 77), does not, says Mr. Masson, mean "limited power," but "fixed power" (p. 223, note); but the very next words, *atque alte terminus haerens*, "and the deep-set goal," make for M. Guyau's view, and are naturally interpreted by him to mean what Mr. Benn means by "the limiting possibilities of existence."

Why is it more difficult to reconcile the two—the law which tethers and the free-will which gives an area of freedom within that law, in the case of nature than in the case of man? No one denies free-will just because he cannot rid himself of the legacies received from human nature and the nature of his ancestors; and, conversely, no one argues that the believer in free-will substitutes for human life in this world Andersen's fairy-world.

It is an old suggestion that the so-called "waste" in nature, and the sacrifice of countless seeds and lower lives, is but the expression of the same freedom which in human life makes evil possible, and causes so much waste there also. If M. Guyau be right, Lucretius says no more than this.

Again, M. Guyau observes that this spontaneity does not disturb natural order, but works along the same lines. Mr. Masson (p. 224) thinks this an arbitrary assumption; but does not the same analogy apply once more? Free-will does not mean freedom to will arbitrarily, but freedom to act upon the highest law of our being; and the will is most free when most obedient to this law. In the same way then, in proportion to the worth and development of anything, will be its approximation to the highest law of its nature. The inner desire, the true will, of each thing moves in this one direction: βούλησις, in Aristotelian phrase, is always τοῦ ἀγαθοῦ.

In this sense spontaneity, human or not, may justly be said to work along the lines of nature. It appears to us—obscure though the connection may look—that the acutest defender of miracles, Canon Mozley, meant something of the same kind when he represented miracles as quickening merely, not resisting, the processes of nature. His theory seems to imply an elasticity in nature which Lucretius describes as free-will.

Mr. Masson shows, it is true, that the ascription of consciousness to matter is against the express testimony of Lucretius (Lucr. II. 972); but his own quotation from Gassendi (p. 220) proves that M. Guyau is not the only student of Epicureanism that has been more logical than Epicurus and Lucretius. It is inevitable that here, as in other speculations, there should be a "development" of doctrine. The ascription to matter of will without consciousness is, as Mr. Masson observes (p. 220), illogical. The spirit of the system in spite of the letter seems to require this assumption: the defect here is in Epicurus and Lucretius, not in the French critic.

After all, the *onus probandi* lies with Mr. Masson. Lucretius says that the atoms originally have free-will. He does not say that this free-will ceases for that majority of them which meet to form gross matter, and survives only in the minority which form the human soul.

The original free-will of nature is a necessary part of the Epicurean system; for without it the origin of the world is inexplicable. The permanence of such free-will in nature, if in one sense unscientific, in another recommends itself to science; for it establishes the "solidarity" of man and nature; and Epicurus, at any rate, believed in human free-will.

Finally, the visionariness and mysticism that undoubtedly attach to it do not seem sufficient, when it is compared with similar speculations of science of recent date, to warrant its off-hand rejection.

Mr. Alfred S. Johnson, M.A., Fellow of University College, Toronto, read the following paper on

THE LAW OF HABIT.

Habit, more than any other principle of nature, may be said to be the *governing principle of life.* All the phases of our existence, conscious and unconscious, physical, psychical, moral, social, are under its control. Occasionally, it is true, there come into men's lives experiences of an exceptional character, elevating, ennobling, or depressing, which ever afterward in retrospection stand alone like mountain-peaks towering above the monotonous plain of common life. Occasions like these, however, are the exception. The vast majority of the actions and experiences of life are on a level plain; at every point the sway of habit obtains, and the general appearance which the plain presents is determined by the habits which have predominated in the individual life.

An instance or two, taken from different parts of our nature, will here suffice to show the wide spread influence of habit. The muscular movements of a very young child are generally performed at random, being the outcome of mere inborn spontaneous energy. If any co-ordinated movements are found, they are instinctive, or due to reflex processes, and not primarily under control of the will, though capable within certain limits of being brought into subjection. To trace the steps in the development of voluntary power of co-ordinated movement, *e.g.*, in learning to walk, is merely to show the influence of habit upon the physical part of our nature. Gradually, through the susceptibility of the child's organism to the plastic influence of repetition, the motions of its limbs become *co-ordinated,* linked together after a regular manner, and the necessity for strenuous attention and voluntary effort at every step dies away. Similarly, in learning to play upon a musical instrument. The great difficulty felt at first in making the movements of the fingers follow one another correctly is lessened by patient practice, the customary motion becomes easier, until a stage is reached where the mere act of sitting down to the instrument, or commencing the series of movements involved in playing, seems capable of bringing on the whole connected train, without further attention on the player's part.

Leaving for the present our physical nature, we note that our intellectual life also owns the sway of habit. No idea ever arises in the mind except through association, and one of the conditions of the strength of association is habit or repetition. The customary thoughts which hold possession of the mind, the customary emotions which the individual feels, and which are often his most striking peculiarities, the ordinary methods adopted by men in working out the problems and aiming at the ends of life, the forms of speech, the various degrees in power of attention, deliberation and resolution, all exhibit to us the workings of this great formative law of nature.

Turning now to our moral nature, we find in the growth of character, the building up or the pulling down of the virtues or vices, the same dominion of habit. Witness the teaching of a child the duty of unselfishness. The sacrifice so painful at first, after a few trials, becomes easier; the tendencies opposing are gradually weakened and dissipated, those favorable are gradually increased, until finally there may even be developed a tendency to over-do the unselfish act, when care has to be taken lest unselfishness should exceed the limits within which alone it is a virtue.

These few instances are sufficient to give some idea of the extensive power enjoyed by habit. But not only is its influence far-reaching and wide-spread, its offices and effects also vary in the different spheres that come under its action. There is, perhaps, no principle of our nature characterized by greater variety in this direction. No other can to such an extent control and modify our physical constitution, accustoming it to strange uses and adapting it to its environment; no other has such power, without changing our psychical nature, to alter the whole method and drift of our intellection; nor is any other fraught with more important practical lessons, for it is only through consolidation of habits that moral character is placed upon a fixed and reliable foundation, and only through development in accordance with the law of habit can we ever hope to attain that destiny for which conscious life and morality were bestowed upon us. It is the greatest of all the appointed means to this end.

In spite, however, of the inestimable importance of the functions of habit, strangely enough, when we turn to the history of psychological speculation, throughout its range we can find perhaps no part of our nature which has been more unsatisfactorily treated. For a full exposition of the manifestations of habit, or a clear understanding of the purposes which they serve, we must look away from professed works upon the subject.

It may not be uninteresting to inquire into the causes of this deficiency of treatment. They may probably be reduced to three:—

(*a*) The failure to bring the subject under discussion, a defect common to many works on psychology, may have been in some cases the result of mere oversight.

(*b*) It may have been from despair of ability to remove difficulties in the way of explanation; for some of the questions involved have appeared to distinguished writers inexplicable. For example, Dr. Reid says: "I see no reason to think that we shall ever be able to assign the physical cause either of instinct, or of the power of habit;" and Dugald Stewart, in the second volume of his works, speaking of the fact that while in some cases the muscles, under the law of habit, are increased in strength through repeated exercise, they yet become more and more obedient to the will, says: "This is a fact of which it is probable that philosophy will never be able to give any explanation."

(*c*) But the failure of adequate treatment in cases where the phenomena of habit have not been overlooked is mainly owing to the fact that certain important phases have entirely escaped detection, which, if their significance had been recognized, would probably have shown the inadequacy of the methods that had previously been adopted in explanation. Thinkers have a common tendency to forget (particularly when dealing with mental phenomena), that while a science remains stationary at a certain point, and until its advancement beyond this point is made possible through the acquisition of a more comprehensively detailed *knowledge of particulars*, of concomitant phenomena and conditions, the ordinary methods of classification and generalization, while their validity remains untouched, may yet prove in the strictest sense useless and inapplicable, and the facts may show themselves amenable only to a higher method.

It is proposed in the present paper to maintain that this is precisely the case in regard to the phenomena under discussion. By the bringing in of particular instances it will be shown that the ordinary definitions and explanations which have been given are inadequate. It is not maintained that the ordinary scientific methods must *forever* here be inapplicable, but that *with the present extent of knowledge* they are so; and that until there is acquired a more comprehensive knowledge of the conditions that govern mental phenomena, which light may possibly come through the researches of physiological psychology as to the correlation of psychical and organic processes, these ordinary methods must remain so. The facts of habit are, in the present state of knowledge of the conditions of mental phenomena, explicable by that philosophy alone which refers them all to *final causes.* These alone shed light upon the varied facts of habit, and in the light that comes from them must these facts be seen and rendered. It will be shown that the effects of habit upon different portions of our nature are marked by the greatest variety, and by apparent confusion and contradictoriness. The known facts of habit are heterogeneous and incongruous. Though occurring in the midst of apparently similar circumstances, they yet refuse to take classification together, or to show themselves resolvable into different manifestations of one and the same law; in fact refuse to be treated by any of the ordinary methods of science, for the simple reason that amidst their heterogeneity no homogeneity, other than merely hypothetical, has yet been found. There may be, in all probability there is, some quantum (which we may designate by x) which further research may reveal, perhaps some modification of nervous organism concomitant alike with all the varied forms of habit, through which their variety may be reduced to unity, and in terms of which it may in all cases, be expressed. The discovery of the value of this x would make the ordinary methods applicable in treatment of the phenomena of habit; would eliminate from them the appearance they now present of opposition and incongruity, would make, in fact, that apparent contrariety of manifestation, the naturally to be expected, nay—the surely predictable result. It is maintained, however, that, even if this quantum should be at any time discovered, the ultimate necessity of an appeal to final causes would not be done away with. Explanation by physical causes, though quite legitimate, does not exclude, nor even render useless, explanation by final causes. The fact would still confront us that x, rëacting in its environment, in the midst of circumstances that are in all cases materially similar, presents us with the greatest diversity of results; and this variety of function must forever remain inexplicable, except as the result of chance (to which to refer it is no real explanation) unless it be recognized as preconditioned and predetermined, and thus, in some sense at least, *caused* by that end to which it is so well adapted as a means.

To the above-mentioned three causes we may in all probability trace the inadequacy of the discussion which our subject has heretofore received. We find it formally examined, with greater or less minuteness as to detail, by most of those who profess to study with any method or precision the conduct of men and the laws of human nature ; but nowhere have we a final settlement of the points involved. We can nowhere find a definition of habit comprehensive enough to embrace the whole field of its energies ; there is nowhere to be found any logically complete and exact analysis of its phenomena ; of their manifold variety we find seldom attempted any systematic classification ; psychology, even though associated with physiology, has not yet philosophically unfolded the law by revealing any general fact or uniformity through which all specific varieties of manifestation may be reduced to system.

There is no general tendency to ignore or underrate the importance of the law of habit. But although the word is in very common use, and the significance attached to it familiar to the experience of everyone, and although writers and thinkers are aware of the importance of the law, and recognize its bearings upon the stability of character, it is yet true that they are unable to dispose of the varied facts which confront them, and do not know how to make provision for them.

It will be our duty, before making further advance, to define precisely that field of study into which the foregoing remarks have to some distance led us. This will best be done, in the first place, by excluding from our discussion all treatment of topics which are irrelevant, the handling of which, unfortunately in different works, has been incorporated with the remarks concerning habit. We note, accordingly, that a strict line of demarcation must be laid down in discussion between our subject on the one hand, and *natural instincts* and *appetites* on the other. True, there is an intimate connection between habits and these latter. An instinct or an appetite may furnish us with an impulse, continued obedience to which will lead to the formation of a habit, and one of the results of habitual action in a certain direction may be the creation of an appetite, as happens in the cases of the libertine and the drunkard. This close connection between the phenomena referred to has been the cause of some confusion in their study. For example, Macvicar, in his work "On

Human Nature," not only allows the treatment of habit to grow out of his remarks upon instinct and appetite, but even goes so far as to say that "the genesis of habits is fully explained by the existence of natural appetites and instincts." But we must not forget that, while the connection between them is confessedly intimate, it is no closer than that which exists between habit and any of the other tendencies or impulses of our nature, for each of these, equally with our instinctive or appetitive tendencies, will lead, if exercised, to the formation of a habit. Besides, however close the relation subsisting between the phenomena indicated may be, it yet remains that habit is neither instinct nor appetite. The word "appetite" is properly used only as referring to those impulsive states of feeling which are characterized by periodicity. They may be primitive and natural, such as hunger, thirst, sleep, &c., or they may be induced through continued indulgence, *e. g.*, the appetite for tobacco; but whatever their variety or origin, our appetites are merely states of feeling produced by the periodically recurring wants and necessities of our bodily or organic life, and which prompt to action for their gratification or alleviation.

Instincts, on the other hand, differ from appetites in that they are always primitive in the individual, never acquired. An instinct is the ability in any individual to perform actions involving complicated muscular adjustments, particularly such actions as are useful, which ability is untaught, and due to no steps of development or exercise through which the individual has passed. This, however views may differ as to the explanation to be given of these primitive facts, is a statement of the essential features of instinct. Individuals do, as a matter of fact, without any course of training, and without any causes that can be pointed out in their own experience, possess the ability to perform actions, which, in degree of complexity of the muscular movements involved, rank as high as many actions usually attained only after a process of development has been for some considerable time at work. We may note in passing, that upon this fact of primitive instinctive ability for complicated action great light is thrown by the modern doctrine of Evolution. To return, however. In neither of the above classes of phenomena do we find the essential features that mark our habits. What peculiarly belongs to habit as distinguished from instinct and appetite, is that *the word draws particular attention to the effects of repeated exercise*, and throughout the present discussion we limit ourselves strictly to this field. We shall consider alone the effects which repetition of an experience or of an action produces, the "Law of Habit" meaning merely that principle according to which repeated experience or exercise produces its effect. And, as before indicated, it will be maintained that the known effects of repetition, in different spheres of its action, are so apparently diverse and incongruous, that the principle which alone, with the present reach to which means of investigation have attained, shows itself to be the governing principle of the facts, is that which regards them all as predetermined, and thus in some sense caused, by that end, as means to the attainment of which they, in their variety, are so strikingly adapted.

We might, at this point, guard ourselves against a peculiar view held by Mr. John Stuart Mill. According to this distinguished writer, habit is virtually the *annihilation of motive,* is a principle of action altogether incompatible with motive. Actions are in all cases originally done from some motive or other; but when through repeated exercise a certain course of conduct has become habitual, Mr. Mill thinks that the actions have ceased to be done from motive. His statements in this connection are made in the "Utilitarianism," Chap. IV., and in the "Logic of the Moral Sciences," Chap. II., Section IV. In the former, after laying down the thesis that pleasure (including its negative, freedom from pain,) is the sole motive to action, and attempting to reconcile this with his belief in the possibility of a purely disinterested act, Mr. Mill, apparently conscious of his weakness, has recourse to a further argument, the substance of which is briefly as follows:—Men perform actions in many cases toward ends which are either perfectly indifferent, or are positively hurtful in their tendencies. This being so, it might seem as if some other end than pleasure were capable of constituting a motive to action. However, instances of such action prove nothing contrary to my thesis that pleasure is the sole motive to action, for when men thus, in the course of repeated action, come to pursue ends which are indifferent, or even hurtful, they have ceased to act from motive. and are under the dominion of habit. "Many indifferent things which men originally did from a motive of some sort, they continue to do from habit. Sometimes this is done unconsciously, ... at other times with conscious volition, but volition which has become habitual, and is put into operation by the force of habit." Now, it would be irrelevant to our subject to discuss the force of Mr. Mill's arguments in proof of his thesis as to the ultimate motive to action, and its consistency with the possibility of disinterestedness. It could easily be shown that, whatever possible construction be placed upon his statements, they involve an inconsistency. We are concerned, at present, only with his opinions regarding the nature of the state at which a man has arrived when we say that his action has become habitual. And while it is not denied that the force of habit may set up the standard of absolute dominion, and man may be its slave, "bound hand and foot," we nevertheless maintain that even in such a case a man's actions are done from motive, and the sway of habit is but the triumph of some particular motive over all opposing forces. For why is anything called a motive? Because, as it is in the mind's view, it stimulates to action. Why, even, do men say that pleasure is a motive? For no reason other than that pleasure is an end, to the attainment of which men direct their energies. To whatever extent views may differ as to the relation between motives and volitions, the general statement will not be disputed, that of motive no other account than that above indicated can be given, namely, as the end aimed at, which, as contemplated by the mind, stimulates to action. A motive is constituted whenever an end definitely in the mind's view is considered in some respect desirable. Well then, when a man by continued indulgence has so enslaved himself that from sheer force of habit he continues to pursue some end of action which has long ceased to give him pleasure, and which may even reap for him a "harvest of pain," are there not present all the elements requisite to constitute a motive? Does not the desire of attaining the end at which he actually aims stand to his action in the same relation in which the desire of pleasure stood, and is it not thus the motive of his action in precisely the same sense in which the desire of pleasure was the motive where pleasure was the end sought? It is not true that as we proceed in the formation of habits we cease to act from motive. Our motives may in the course of such development change, and permanently change, certain ends of action may forever lose their charm, and thus be stripped of their prompting or stimulating power, ceasing in this way to be motives, but they die only in giving way to stronger forces. The formation of a habit is not the disappearance of motive, it is rather the setting of some motive upon a throne, it having acquired such power as to operate on all ordinary occasions on which its exercise could be looked for. Indulgence of lower appetite, *e. g.*, may have become so habitual that all the claims of moral law may practically have ceased to make their voice heard in the presence of immediate empirical instigation. But this is not the annihilation of motive; it is the usurpation by one motive of the sceptre and dominion that rightfully belong to another.

The attempt to find some single universal principle, under which all the various manifestations of habit may be brought, brings us face to face with the question so freqently discussed as to the relation in which the law of habit stands to the *association of ideas.* The views which have hitherto generally prevailed divide into two classes the diametrical opposites of one another. One class of writers contend that the law of habit is an ultimate original principle of our nature, incapable of analysis into simpler elementary constituents, or of subsumption under any wider law from which it may be deduced, or of which it may be regarded as a special case, and they resolve the association of ideas into the principle of habit. Of Dr. Reid it cannot, as a general thing, be said, as has been said of Mr. James Mill by one of his connotators, that his desire to avoid unnecessary multiplication of fundamental laws in exposition or explanation of mental phenomena has often led him into the error of resolving into different manifestations of the same law phenomena which are governed by laws really and fundamentally distinct. On the contrary, in general, there seems to be an absence of all such desire on the part of Dr. Reid. Occam's "razor" is a tool which he seldom uses. With a little more careful scrutiny he might easily have seen that principles which he regards as ultimate and original are not so, but are capable of resolution into, or at least of subsumption under, simpler and wider laws. However, the desire mentioned has certainly influenced Dr. Reid in his speculations on the point with which we are now concerned. He says: "I believe that the original principles of the mind of which we can give no account but that such is our constitution are more in number than is commonly thought. But we ought not to multiply them without necessity. That trains of thinking, which by frequent repetition have become familiar, should spontaneously offer themselves to our fancy seems to require no other original principle but the power of habit." And this view is not without its adherents at the present day, for Dr. Noah Porter, in his elaborate work entitled "The Human Intellect," contends that "the law of association rests upon the same original principle which explains the law of habit," .and even says "the law of mental suggestion or association is only a special form of this general law or principle."

The other class of writers, of which Dugald Stewart may be taken as an example, bring the principle of habit under the laws of association of ideas. It is, however, wisely remarked by Stewart, that the extension of the term "idea" must be widened so as to include every operation of mind, and we might note that a still wider application of the term is necessary in order to give the slightest plausibility to the theory, which will make it include not only every psychical, but also every corporeal effect capable of entering into conjunction with others. That philosophers should be so diametrically opposed in their views on such a question is perhaps, at first sight, a little surprising; but the variety of opinion is no greater than that which exists on all questions of a similar nature, where the point at issue is largely as to the meaning of a term. The discussion of the question involves distinctions which are to a great extent, if not altogether, merely verbal. It is not on that account, however, unimportant, for there is a wrong as well as a right use of words. Language has a use to serve, and its functional efficacy is destroyed by abuse; and expediency in its employment requires that, unless in very exceptional cases to subserve a higher use, words shall not be wrested from their ordinary meaning, nor be deprived of any of the associations that attach to them in the world's ordinary discourse. Now, keeping the above precept as to the use of words in view, it will readily be apparent that the merit, if any merit rest in the discussion at all, cannot lie with that class of writers typified by Dr. Reid, for association of ideas cannot be explained from habit, or resolved into the same, without at least depriving the expression of a part of its denotation, a very large part, and one of the greatest importance. It has been remarked by Sir Wm. Hamilton that "we can as well explain habit by association as association by habit," and we shall shortly give our reasons for thinking the remark probably true, if by "association" the principle of contiguity alone be referred to. But to restrict the expression thus is to wrest it from its ordinary and legitimate use, which makes it include in addition the principle of association by similarity. We certainly require a word to denote the working of this principle, the importance of whose influence cannot be over-estimated. The word "association" has been handed down in this express use, and no valid reason can be given why it should not be continued in that meaning, which makes it include every principle whereby one mental or bodily state or action suggests another. These principles comprise similarity as well as contiguity. (For present purposes, as not relevant, we may leave out of consideration the principle of contrast.) Now, if the expression "association of ideas," allowing to the word "idea" the necessary widening of its application before referred to, be still used as ordinarily, the association of ideas cannot be resolved into or explained by the power of habit, for association by similarity cannot be so explained or resolved. It stands alone as a distinct and ultimate principle of our nature. Its working, though inextricably intermingled with that of contiguity, is logically prior to it. The absolute and indelible distinction between this principle of association and the power of habit is seen in the fact that association by similarity is primitive, whereas habit has express reference to the moulding power of repetition. Only after repetition can a habit be formed; but similarity may produce its effects at once. It is possible to cite instances of its working where there has been no previous experience, and therefore no possibility of the formation of any result through repetition, as *e.g.* in the identification hit upon by Franklin of the similarity in nature between lightning in the sky and the phenomena of electricity.

Evidently then association of ideas cannot be resolved into habit, unless *at least* the principle of similarity be left out of consideration. The question then remains :—Can we bring habit in under association of ideas as but a phase of the working of the principle of contiguity? We answer : Yes, in all probability. The hypothesis that all the varied manifestations of habit can ultimately be shown to be essentially similar in the working of contiguous association, is that which, in the present state of knowledge of the facts, most commends itself to our acceptance. We note, however, that it yet remains a mere hypothesis, not having been brought to the test of a complete scientific induction. We accept it, therefore, in the meantime only provisionally, awaiting complete verification from further research. Its commendation rests, in brief, on the following considerations :—

(*a*) Habit and contiguous association alike have express reference to the plastic power of repetition. Both recognize its necessity as a condition of the growth and strength of tendencies in any direction. This fact is at least a finger-post, though admittedly fallible, pointing to similarity in the nature of both.

(*b*) Many of the results of habit are apparently completely resolvable into manifestations of contiguous association. Thus, in the case of the so-called "secondarily automatic" actions, as when an accomplished pianist commences playing, and the customary trains of muscular movement are kept up without the arising in consciousness of their mental concomitants, there is apparently no necessity of recognizing anything else as involved than the mere linking together by contiguous association of a series of muscular movements which have been frequently performed in regular succession, in such a way that the appearance of the first link tends to call up the rest.

(*c*) There are no phenomena of habit which are positively known to be incapable of reduction to the outcome of contiguous association, the utmost that can be said being that in some cases we cannot from direct evidence affirm the applicability of the principle of contiguity in explanation.

(*d*) Where this inability exists it seems to be accounted for by the empirical limitations upon our knowledge of the facts possibly concerned in the case. For example :—Repetition of exercise on the one hand increases the efficacy of some of our perceiving powers ; the eye becomes more sensitive to shades of color, the ear more acute to apprehend distinctions of sound. But on the other hand, certain of our primary susceptibilities suffer a deadening effect from repetition of affection. Thus the sensibility to heat and cold, to the glare of sunlight, and to hard and rough contact with rude and pungent and hurtful agents, lessens under exposure to them. A similar apparently contradictory variety of effects is seen in the case of our emotions. Love, fear, pride, and other emotions are stimulated by exercise ; but grief, by indulgence, in the healthily constituted nature gradually dies away. Now, it seems difficult to represent these diverse and apparently opposite results as in reality merely different manifestations of the working of some one law, such as the principle of contiguity. There is nothing illegitimate, however, in our setting up this account of them as a scientific hypothesis awaiting verification. It is quite possible that all such seemingly opposite directions of the energies of habit may have some common physical basis which further research into the correlation of mental and organic processes may reveal. It is to be noted, however, that even if this physical basis, which we have before spoken of as a quantum x, should be discovered, and all forms of habit through it be shown reducible to energies of contiguous association: this would be no ultimate explanation; it would be merely to resolve one set of phenomena into another, which is to explain neither the one nor the other; it would be merely to employ different words to express at bottom one and the same identical fact. The need of belief in design would not be dispensed with, an appeal to final causes would still be demanded by the number and co-ordinated action of the facts of our nature concerned in the case, explicable in no other way than this, unless regarded as a chance co-incidence, in which explanation, however, the mind refuses to rest.

Omitting now further discussion of our subject in its aspect as related to association, we proceed to a brief exposition of the ultimate results attained by those who have heretofore given it careful thought. These writers we might in this aspect separate into two classes. Those of one class attempt to set forth in express definitions the main facts and principles of habit, and in this way would be very explicit in their treatment. We shall find, however, that it is precisely these authorities, these who strive most to be definite in exposition, who have really been the most inaccurate. The other class, not professing to offer definitions as explanations, endeavor by use of different forms of expression and the drawing of analogies, to present a comprehensive and systematic view of the principles of habit. Their expositions, however, are in all cases open to the serious objection either of vagueness, or of entire want of meaning.

Wherever definition has been attempted, we find a striking amount of agreement in the use of words. In these cases all the manifestations of habit have appeared to be comprehended under the notions "*facility*" and "*impulsiveness.*" For example, Dr. J. D. Morell in his "Mental Philosophy" takes the following ground:—In many cases, even though volition be put forth, the desired movement of muscle fails to follow, and in order to bring about the result aimed at, no mere effort of volition is sufficient, a practical training is required; and "when by such training new *facility* is acquired, the power thus formed is termed the power of habit." Habit is thus merely facility of bodily action acquired through exercise. Dr. Reid too tells us: "Habit is commonly defined, a *facility* of doing a thing acquired by having done it frequently." But, conscious that the notion of facility is not all-comprehending, and unable to do more than confess the weakness of the above definition, he supplements it by saying: "This definition is sufficient for habits of art, but the habits which may with propriety be called principles of action" (namely, our moral habits and acquired appetites) "must give more than a facility, they must give an *inclination* or *impulse* to do the action." To Dr. Noah Porter also the conception of facility appears to comprehend the main facts of habitual exercise. The following sentences indicate his position:—"Habit, Latin *habitus*, Greek ἕξις, is literally a way of being held, or of holding one's self. Thus defined it must denote a permanent state of rest which has been reached as the result of action or growth, or a permanent form of activity, or of *readiness* or *facility* for any kind of activity."

However, an attentive study of the specific differences in the energies of the law of habit will show us that, if put forth as all-embracing definitions of habit, these notions of *facility* and *proneness* or *impulsiveness* are lamentable failures, for they will be found to be false and inapplicable in as many cases as they are true, and for subserving any systematic purpose they are totally useless. In order to avoid these difficulties thus merely indicated, the other class of writers resort to various forms of expression which, however, are either possessed of no meaning at all, or leave the subject still upon our hands with none of its hard and rough points smoothed down, none of its difficulties explained away. The lexicographers, *e.g.* Webster, commonly tell us that habit is "a *disposition* or *condition* of the mind or body acquired by custom, or the frequent repetition of the same act." The embarrassment common to the lexicographers we find also among the psychologists. Upham in his "Mental Philosophy," in a section entitled, "Of the Effects of Habit in giving Strength to the Will," says: "We often see its results in the case of the vicious man whose unholy propensities go on *strengthening* and *strengthening* under its influence, till they assume the stubbornness and inflexibility of iron. . . . It is the result of the principle of habit that every act of the will . . . gives *vivacity* and *strength* to the succeeding act." We might cite here, too, in virtue of certain statements of his, the name of Dr. Morell before mentioned. He has recourse to the use of a word which, like the word "property" or "quality," is offered as an explanation, but amounts only to a re-statement in different words of the fact or facts to be explained. It occurs in the following passage:—"The power of habit may be traced to the operation of a certain law of our nature by which every time we perform a given action a *residuum* is left in the mind which renders the facility of performing it again, and the tendency to do so, greater." This word "residuum" explains nothing. Finally, Macvicar regards habit as the psychical expression of a special "myo-cerebral" rhythm. Such a rhythm, or organic binding together of parts, is produced "by practice or exercise." "And," says he, "if anything occur or is presented to the senses which commences that rhythmical state, the organism will tend, perhaps with insatiable or invincible force, to complete its act." This view, however, is given without any attempt at philosophical deduction, thus amounting, with the other views we have just cited, merely to the use of more or less convenient forms in which to express, without explaining, facts patent to observation. The treatment of the question in general at the hands of psychologists, is characterized by Dr. Chalmers as "an obscure and profitless speculation." Certainly little result has so far come of it, and its inadequacy we in some instances find confessed.

It is the extreme variety to be met with in the offices and manifestations of habit that renders so difficult a comprehension or a definition wide enough to embrace all the facts, and this for the reason that nothing can yet be definitely shown common to all the forms of this variety. This difficulty, betrayed or confessed by systematic thinkers, is likewise apparent when we look at the proverbs or maxims which express popular views of this subject. For example, we often hear the expression "Practice makes perfect." But, as if knowing that this was untrue when taken as an universal proposition, and needed correction, another proverb tells us "While habit *strengthens* reason, it *blunts* feeling." This latter view has been contended for philosophically. It appears to have been Bishop Butler's conception, and he cites it as an incentive to active virtue, pointing out that while habit comes to our aid in *action*, increasing the tendencies and facilities for the performance of work, it has a deadening effect upon our *passive* susceptibility.

Another adage tells us, referring to a wider operation of the law, "Habit is a second nature," this being allied to the view of Lord Bacon, "Custom alone doth alter and subdue nature." And still another maxim, recognizing the moral importance of the law, says "Man is a bundle of habits." In these maxims there is recognized a variety of functions greater than belongs to any other law of our nature, namely: the power of habit to train and develop the intellectual and voluntary powers of mind and body; its different effects upon the reason and some of the emotions and simple feelings; and the great power which it has, while leaving untouched our intrinsic nature, to alter our whole moral character and mental tendencies and method. Maxims as a general thing embody the practical wisdom of mankind; and for all ordinary purposes of the world's business these maxims regarding habit are a sufficient practical philosophy. But, while the common and unwrought notions of customary experience do, only because they must, furnish that philosophy which serves the ordinary uses and necessities of life; yet for highest and ultimate truth we have to look away from these to science which proceeds upon some settled principle, and endeavors to reduce all facts of possible investigation to some precise, definite, and symmetrical system.

The defects common both to the ordinary popular and the studied and systematic views of this principle of habit will be easily apparent, if we notice now some of the specific varieties to be found in the manifestations of this great law of our manifold life. The following, presented without special regard to order, might be noted :—

Repetition of exercise strengthens and quickens our *external senses*. The eye is rendered more sensitive, the ear more acute to apprehend minute distinctions, and the same is true of the other senses. The sum total of the effects of previous impressions appears to be in every case re-instated, giving additional strength to the effect of present stimulation. Thus, in what appears to the landsman a mere speck upon the distant horizon, the practised eye of the sailor can read sufficient to enable him to tell the nation, size, character, and bearing of some outward or homeward bound vessel. Similar instances might be cited in connection with the senses of hearing, taste, and smell, and the history of the sense of touch and the muscular sense abounds with examples, as in the case of the blind.

Our *ideal representations* also are increased in intensity and vividness, in fulness and minuteness. While the pleasure or the pain of the pristine shock abates under repetition within certain limits, yet for intellectual purposes the value of an impression increases with every subsequent experience, and accordingly the ideal representations of memory and imagination, in degree of vivacity and minuteness of detail, under the influence of habit, may rise very near their originals. Habit, too, develops our *acquired perceptions*, and the accuracy of the judgments to which it leads is often most remarkable. For example, the eye originally, and of itself, receives nothing but impressions of colour; but through habit we may acquire a wonderful degree of accuracy in judging by sight of the distances, forms, and magnitudes of objects; and these judgments may be framed so readily that to ordinary observation they appear immediate, and the intricate processes really at work are hidden from view. It is, however, curious to note that upon certain of our primary susceptibilities, *e. g.* the susceptibility to cold and heat, and the rough contact of hard or injurious stimuli with the sensitive surfaces both of the skin and intestinal passages, the effect of habit is directly the reverse of that which was found in our previously cited instances. There is no fact more familiar to everyone's experience, than that exposure lessens sensibility to pain. While the eye is increased in value as an instrument of mind by repeated impressions upon the visual nerve, while it becomes ever more and more sensible of those qualities of external objects which constitute its peculiar province, it at the same time becomes more and more insensible to hurtful impressions by exposure to them. The glare of sunlight and excessive heat are gradually stripped of their power to injure. In the same way the tongue and palate may become accustomed to the most pungent fluids and solids so as to bear them with impunity, while at the same time their power of appreciating minute distinctions of taste may regularly improve, as, for example, in the cases of the wine-tester and the gourmand. Here we find alongside of one another, nerves which have been subjected to the same action, on the one hand quite callous to the pungent and fiery effects of alcohol and strong spices, and, on the other, having such a delicacy of discriminating power as might seem impossible to an individual accustomed to plain diet. The general statement, then, that habit blunts feeling, is most inaccurate, for we find that even among our simple primary feelings there are cases which flatly contradict it. The effect of habit upon some is deadening, but upon others quickening. Still more inadequate is the notion shown by consideration of our complex states of feeling which we call emotions. Here, too, we find the same apparent contradictoriness in the effects of habit. As Dr. Bain points out, "our emotions may be steadily increased by culture." Fear or flurry may be rendered the customary thing by habituation. Habit does not blunt the feelings of pride, of self-esteem, of the pleasures of benevolence, of paternal love, and motherly devotion and tenderness, but quickens and strengthens them. With all regular exercise these emotional tendencies grow in vigor; but, on the other hand, grief, and remorse, and shame, are gradually exhausted by being indulged.

In the same way frequency or persistency of exercise vary in their effects upon the different faculties of our moral nature. In short, the conclusion is established, with every degree of probability, that the effects of custom, or habit, or frequency of repetition (it matters not by what name we group together the influences at work), vary with every variety in the nature of the capacities exercised.

We note again, that not only do the effects of habit vary when different powers are subjected to it; but also that its energies may be exerted in strangely different directions within the sphere of each separate power. For example, let us compare the results developed by exercise of the power of voluntary muscular control in the following cases:—

(*a*) Of the accomplished pianist;
(*b*) Of the blacksmith, or the porter;
(*c*) Of the professional boxer, or the ballet-dancer.

In the first, exercise of the voluntary muscles gives extreme facility of movement without any proportionate increase of strength. In the second, it develops strength, massive power and endurance, without any corresponding increase in facility of rapid movement. In the third, the effect seems to be due to a combined action of the previous modes of increase, the muscles developing at the same time a surprising degree of rapidity of action and robust energy. Though greatly increased in strength, they are yet more and more brought under dominion of the will.

Our intellectual faculties, under habit, exhibit to us a similarly varied scene. Here, on the one hand, we find readiness and dexterity of thought and quickness of combination, as in the power of extempore speaking. There, on the other hand, is found massive power and plodding endurance. And yet again we find that exercise may develop energy and agility in unison, as in legal and parliamentary debate, and in the higher styles of poetry. In such cases as these, while the notion of increased facility or force, or both, is sufficient to serve all ordinary purposes, yet, as has already been evident, as a scientific definition, it is not definite enough even where most applicable; and when regarded as a general apprehension, it is fallacious.

But still more than those instances which we have already mentioned, there are certain phases of the working of habit apparently not hitherto noticed, which render evident the essential defects in the treatment and explanation offered. The phases referred to are the following:—In relation to the will, the increased obedience of our thinking and voluntary powers of mind and body, and at the same time the increased resistance offered by another portion of our nature, including our emotional and impulsive tendencies, whether appetitive or instinctive. It is in reality just at this point that the difficulties, to Reid and Stewart, appear insuperable; but it is precisely here that, both for speculative and practical purposes, the greatest need becomes felt of a true and comprehensive philosophy of the facts. Our rational or thinking powers, as well as those directly under control of the will—the perceptive and reasoning faculties, the voluntary muscles—while their strength grows by frequent exercise, become continually more prompt in submission to the mandates of the will; but on the other hand our affectional and appetitive tendencies, by being indulged grow more and more ungovernable by the will acting under the law of reason. Fear, lust, anger, for example, may be cultivated until they become absolute rulers of the individual, until under them one loses all power of rational action, being tossed about hither and thither, like a cork upon the waves, by forces over which he cannot exercise the least control. This forfeiture of liberty, due to procedure along certain lines of habit, is something that demands the student's careful consideration. It is fraught with lessons of immense practical importance, and a thorough understanding of its conditions is necessary; but it is in vain to look for light to the history of psychological and ethical speculation. We are taught by Holy Writ in many ways that whoso committeth sin *enslaveth* himself, but philosophy has nowhere yet comprehensively seized upon this great fact.

A review of the phenomena resulting from the law of habit has now been given sufficient to show how inadequate the Inductive Method of philosophy as laid down by Lord Bacon must prove for purposes of explanation, so long as our knowledge of the facts possibly concerned remains as it is. The object of Induction is to unravel the great complexity of nature, to point out in the grand uniformity apparent amidst this complexity the particular uniformities that exist regarding special facts. Bacon himself thought that all other methods would be superseded by that which consists in the systematic classification and arrangement of facts. The foundation for all advancement to truth must be laid in the instances and facts of experience; man must begin by observing nature, then interrogating her, subjecting her to a critical observing and experimental investigation. He must then *ascend* from a clear and distinct knowledge of facts and particulars thus acquired to those general laws or principles on which they depend. The order of procedure, never to be reversed, is *upward* from particulars to classes, thence upward still from class to higher class or wider class, as from circle to circle, until the most general fact of all, which reveals to us the law, is reached at the central point and summit of the ascending series. The successive inductions are merely more general facts rising out of those more particular, until the process ends in the most general of all, the law or essential principle sought.

But clearly this method must fail of applicability in treatment of the now known facts of habit, facts which are incongruous and incoherent, which, occuring in the midst of apparently similar circumstances, nevertheless refuse to take classification together. This method, as has been beautifully said, "cannot march and countermarch upon the same plane in its route to results." One set of instances points toward a general law, but the next says "right about turn." We can find underlying the known phenomena of habit no general fact broad enough to embrace all specific varieties. In some cases we find that repetition or persistency of an action or impression gives *increase* of facility, or strength, or both; but we cannot thence infer a general law or construct a definition because, in turning to the very next set of instances, we find that similar repetition or continuance of action or impression gives *diminution* of strength or facility. No class of phenomena could be better chosen than the phenomena of habit to illustrate the weakness of the Baconian method. It collapses here in utter helplessness and unfitness. It can find no common centre for facts so eccentric; it cannot bring together lines so little convergent that the point at which they meet lies far beyond the utmost boundary of its vision. It might be noted in passing that Bacon himself was rather timid and reserved in the application of his method to psychological investigations. As might naturally be expected, "with a boy's fondness for a name and a banner," Bacon carried his method, which though perhaps not to be called new, yet had been raised by him into a principle, beyond its legitimate province, and claimed for it an exaggerated power, and a range broader than its birthright; but, in relation to psychological and ethical speculations, he admits "it must be bounded by religion, else it will be subject to deceit and delusion."

It constitutes, perhaps, Mr. J. S. Mill's chief glory as a logician, that he showed the insufficiency of the Inductive method as laid down by Bacon. Bacon allowed only one order of procedure, namely, upward from particulars to generals, and thence still upward, this order never being reversed. But the greatest triumphs of science since Bacon's time have come (nor could they otherwise have come) through a method in which this order of procedure is directly reversed. Bacon failed to make room in his system for the Deductive Method of Inductive investigation, and it is clearly shown by Mill that this was the grand defect in Bacon's inductive philosophy. Subsequent history shows us the Deductive Method, that of *verified hypothesis*, to be the universally accredited method of modern science. It would, of course, be foreign to our subject to set forth the features of this inductive philosophy as amplified and extended by Mill. Suffice it to say here that the only laws it is capable of revealing are the laws of physical causes. Of final causes, such as those demanded by co-ordinated action of laws, it takes no cognizance. "The only notion of a cause, which the theory of induction requires" (if experience can give any *notion* at all) "is such a notion as can be gained from experience." To the consideration of such causes the province of scientific induction is strictly limited. It seeks not to penetrate beyond the sphere where phenomena are linked together according to definite and fixed rules by mechanical necessity. In short, physical causes are the sole objects of inductive science; and in dealing with the facts our reasoning cannot be too rigidly mathematical. Now, the same rules of careful observation, the same precautions against error, which are employed in physical science, are to be adopted when the phenomena of mind are the subject of investigation; the methods of analysis and classification that are available within the sphere of physical science also hold within the domain of mental science; and there is profound truth in the saying of Prof. Huxley: "On whatever ground we term physiology science, psychology is entitled to the same appellation; and the method of investigation which elucidates the true relations of the one set of phenomena will discover those of the other." As facts given us for study, psychical facts are to be treated under the same rules of observation and analysis as those of physics; instances are to be brought in to establish conclusions, and must be ascertained by similar laws of evidence and with equal precision. But it should never be forgotten that in the region of mind, and when the laws and purposes of mental phenomena are in question, we are working in a region that in many ways transcends the physical, transcends it in the complexity of processes concerned, in the obscurity of many of its conditions, and the difficulty of available means of inquiry; and, at least in a certain stage of our advancement to truth, omitting here the question whether it must not always be the case, a higher mode of explanation than the merely physical is that which alone satisfies. It is only while psychical facts remain, as it were, upon the dissecting table, or are subjected to rëagents in the laboratory, and only while thus they stand before us on the same footing with the facts of physiology or of chemistry, and we have, or may have, a thorough knowledge of the conditions affecting any particular experiment, that these facts are at all amenable to the methods that for scientific purposes prove sufficient within the spheres of speculation referred to. When they rise into the realm of rational life, and we attempt to philosophize upon them, and seek to discover the presuppositions they involve and to lay bare their governing purposes, the mind rests only when answer and illustration are given in the ends toward which they point.

Even the explanations offered by physical science shed no light upon the inner working of nature. What is called explanation is, as Mr. Mill admits, "but substituting one mystery for another, and does nothing to render the general course of nature other than mysterious; we can no more assign a *why* for the more extensive laws than for the partial ones." It might even be contended that until scientific methods take cognizance of final causes, they are not true to that principle of causality upon which they all alike rest; for until they do so the phenomenon of repeated co-incidence and co-ordinated action of causes remains unexplained. Even then within the range of inductive science want is felt of some higher explanation. The realm of matter points us to mind, matter being only a means and a slave, with all its functions and references significant only in a region above and beyond itself. It acts and moves only as it is impelled; its laws are physical causes, and its expositor that philosophy which deals with facts of mathematical or mechanical necessity. But when we leave the merely material, or even the organic, and come to the world of psychical and rational life, we find that the ruling principle cannot be expressed as an impelling force, but as a moral purpose, and only through the thought of highest ends can the mysteries that involve us fade away into the light of intelligent solution.

Directed by the principles indicated, we will now note the most important facts and purposes of the working of habit.

It is a law of universal life obtaining in the vegetable, animal and rational kingdoms. It is a law not only of intellectual and moral faculties, but even of animate textures. It is a law of growth and development; only through it are those faculties educated and enlarged whose perfection is intended in the creature's existence. And, as a subsidiary to this end, it hedges the individual round with a protection against all *hurtful increase* of those feelings and tendencies whose indefinite enlargement would hinder the attainment of the end designed.

The influence of the law of habit varies in the different spheres of its action, and its effect upon the different faculties subjected to it are more or less remarkable according to the rank of importance which these faculties severally occupy in a scheme of our constitution. Their respective relative importance determines their rate of development. Its effects within the vegetable kingdom are easily noticeable. We find, for instance, that vegetables, within a narrow range, may become inured to strange climates. Still more apparent are the influences of habit upon animal organizations. Animals are adaptable to foreign climates; and, under training, surprising facility is developed for taking on new modes of muscular adjustment. But it is when we come to the higher emotions and intellectual and moral powers of man that we discover the greatest energy of the law. The capacities of development and of strength and stability of character to be acquired through habit are here quite indefinite. And it is to be noticed that the powers which illustrate here the greatest energy of habit are precisely those powers whose highest development is a condition *sine qua non* of the attainment of the ultimate destiny of the creature, as being involved in that attainment. These powers under habit exhibit to us agility and strength combined. Through habit power which has been obtained is rendered permanent, just as through memory knowledge is treasured up, leaving open the way for further development; just as money put out at interest will add each year to the ever-growing principal that which, being blended therewith, will yield further interest. If there be a destiny whose ultimate attainment is in the design of the creature, some such powers of acquisition and expansion are obviously necessary. Only through their means are growth and progress possible. If there were no such means provided there could be no life in the universe; vitality would be reduced to mechanism, for only growth and progress distinguish it therefrom. This necessity of some powers of development as a condition *sine qua non* of real life itself did not escape the notice of Dr. Reid, and is clearly and beautifully expressed by him as follows:—"As without instinct the infant could not live to become a man, so without habit man would remain an infant through life, and would be as helpless, as unhandy, as speechless, and as much a child in understanding at three-score as at three."

The adage which tells us that habit *blunts* feeling is true, as we have already seen, only of certain of our feelings, its effects upon others being quite the reverse. And a fact which renders our argument for final causes still more conclusive, is that between those sensibilities whose powers are exalted and those which suffer a diminishing effect, no known difference can be pointed out capable of explaining the diversity and contradiction seen in the workings of habit, except the difference of their respective ultimate purposes or ends. Those whose highest growth and enlargement are necessary to the creature's perfection, are precisely those which receive at the hands of habit the strongest impetus; while those whose indefinite increase would hinder such perfection are, through the influence of the same law, stripped of their power to injure. In the degree in which they are beneficial and helpful they are allowed free indulgence; however, the moment they overstep this boundary, the moment their further enlargement would be an aggravation, that moment the law of habit interferes to turn aside and disarm the threatened danger. In this way habit is a law of protection and defence, aiding that development and that only whose completion was intended in the design of the creature by its Author. For example, our bodily organs of sense and movement are instruments through use of which the mind exerts itself to accomplish its ends. Imperfection or injury of an instrument will lower its utility; and consequently, if the body is faithfully to fulfil its functions, it must be preserved from external injury and internal irregularity. But, as man is empirically situated, his organism is not so nicely adjusted to its environment as to be absolutely secure from harm. On the contrary it is necessarily exposed to many harmful affections, and even to much abuse of its own functions.

From these injuries, pain and fatigue, by a provision that reveals the wisdom of an all-wise Creator, are commissioned to protect and warn us. This they do by reproof, and by attaching penalties to continued or repeated indulgence; and, while their voice is likely to be heard, they cease not to exert it. But just as soon as their further continuance would be in the necessity of the case useless, or itself injurious, at that point they are destroyed or counteracted by the working of another provision of our nature equally beneficent with the former. We necessarily meet with some hurtful agents at least. No one can escape them. In such a case, if the result of habit, or of repeated impression, were to increase the organic sensitiveness in the same way as it increases the powers of perception and the voluntary powers, then protection against necessary injuries would be to us a dream. Through necessary exposure we would soon possess such extraordinary capacities of suffering that every feeling would be an agony, every offensive smell would become an intolerable stench, every touch would sharpen into a sting, and every ray of light would quicken into burning fire. Against such evil as this habit comes to our aid as an angel of protection, abating our sensibility to excessive heat and cold, and the painful effects of other hurtful agents. This it does as nicely and as exactly as the exigency could require, as accurately as if some beneficent and all-wise director superintended the working out of results. What we cannot avoid we are enabled to endure, habit kindly throwing the protection of its insensibility over our suffering sense. It is in the same way that certain of those pains of emotion, unavoidable in the ordinary run of life, are restrained and prevented from injurious excess. They are allowed to continue to a certain degree, namely, as long as they are regulating and beneficial; but just as soon as their further indulgence would be injurious the voice of habit interferes to prevent that growth which would without it be unavoidable. And thus we find that our bitter disappointments and anxieties are after a while calmed down, through the beneficent operation of laws that enter into our very constitution, and in such manner as even to render greater our appreciation of after enjoyments. And in the same way, even those bitter bereavements which come to us through loss of some object of tender affection, which must for a time run their course in paroxysms of grief, are gradually abated in the healthy constitution until, after lingering for a while, grief and lamentation give way to cherished memory, and the most cruel anguish shades gradually into a tender melancholy that has even its element of pleasure. Grief fades away, but the "pleasures of memory" are still ours, and the love remains unchangeable, and the ordinary interests of life come back, and its duties take on again their customary attractiveness, bringing at last a joy which at first would have seemed a mockery. In this way the tears of the mourner are wiped away, while the affections of his heart are still true; he is preserved true to affection, and yet capable of duty; and those unavoidable accidents of bereavement are deprived of their power to destroy through the very sensibilities which most feel their influence.

It remains to treat of the law of habit in relation to our moral nature. Its importance in this connection cannot be over-estimated, When its energies are directed in the line of virtue, it is as an army of power to aid in withstanding temptation. It strengthens and makes sure our resistance, and it renders comparatively easy of acceptance the most arduous commands of duty. This it does by adding to the virtuous tendency and weakening opposing forces, each victory helping to further conquests. He who has made a practice in his daily life of preferring the higher to the lower, he who steadily repels the base promptings of the lower impulses, will in time find that they will cease to rise in opposition, and may even be brought into helpful agreement with the promptings of his better nature. Issuing victorious from the hard conflict in the beginning, he goes on without limit to greater and more important deeds and sacrifices, gives to life itself one grand and inspiring purpose, and finally forms a character that will last eternally. His frequent victories in time instil into his whole character their accumulating and permanent consequences. The stability of virtue is thus founded upon the principle of habit. However, the principle is as powerful for evil as it is for good. Through it the tendency to evil may grow, and become fixed, and vice may become the absolute despot of the soul. Abuse of our faculties may become their only use. The growth of moral good and evil depends upon the operation of one and the same law, which, in virtue of our freedom, gives into our own hands the regulation of our life and character. The spirit of the outcast and abandoned has been developed through exercise as well as that of the saintly and pure. Man, as he comes from the hand of the Creator, is endowed with powers. In their actual use he is free and unconstrained. Through this law of habit, which rivets the consequences of action indissolubly upon the agent, he is the "architect of his own destiny." The proverbs which tell us "Practice makes perfect," and "Habit is a second nature," contain a vein of deepest truth, namely, the recognition of the stability and assurance that habit gives to moral tendencies. Without this assurance we could have no confidence in character, and without this confidence in character, this faith in human nature, the very foundation would be withdrawn from the institutions of society. For example, without it men would not become parties to any schemes except such as bring immediate results. The medium of exchange would lose its value; business agreements would be mere shams; in fact all the apparatus of commerce would become paralyzed and useless. In the same way everything belonging to men as constituting societies, distinguished from men as merely individuals, would be deprived of that upon which it could alone rest. It is this confidence in the special direction of tendencies due to previous exercise therein that causes a man's reputation to be accepted in legal courts as evidence of his innocence or guilt, a man's reputation being but his own shadow projected upon his pathway by the light of his past life. And it is this experience of the abiding character of the results of habitual action which constitutes the foundation of all our trust that the training which we give the present will develop in the future the results desired. Men will live, in fact *must* live, as they have learned to live; what men choose continually they finally become, just as unchangeably and as certainly as if the Creator had originally made them so.

This law of habit, in this way, warns us of the terrible fact that the tendency to evil, through continued practice, shall grow and finally be confirmed, that abuse of our moral faculties shall, through indulgence, become at last their only use; that our lower blind and animal propensities shall become, if allowed freedom from restraint, irresistible; and that in fact whosoever committeth sin selleth himself into *slavery*. If this were not the case; if continued practice of evil produced no abiding consolidation of results in character, then the basis and stability of our virtues would to the same extent be shaken, for they rest upon the same foundation. We may not be cognizant of the growth of these results. Consciousness fails to reveal it, just as it fails to reveal organic growth. We fail to recognize the end toward which we are drifting. We do not realize that the moments we spend carry us forward silently but irresistibly to death. We cannot see that each successive day is marked by steps either in our growth or decay. These facts are revealed and certified, however, by observations taken at distant points in time. In the same way, through the "robust consciousness of liberty," we are deluded into believing that we shall always be able to govern ourselves, and that although the path of reckless indulgence may have been trodden for years we shall, after they have lapsed, be as free to choose our course as we were before that path was entered upon. We are confident that our strength of soul will remain unbroken, and that at any time we choose we can quell the surging tide of passion by a word. But we forget that sin is truly bondage, and those faculties whose very life and health consist in their freedom, will remain in spite of everything with all this slavery of habit bound upon them.

> "Never let man be bold enough to say,
> Thus and no farther let my passions stray;
> The first crime past compels us on to more,
> And guilt proves fate which was but choice before."

The wisdom of the provision by which these abiding consequences of good or evil are attached to conduct is as apparent in its adaptibility for highest purposes as that seen in the power of growth with which the intellectual powers and voluntary powers of movement are endowed. The springs of moral action in man are subject to the same law of development as these other powers, in virtue of his nature as a free and responsible agent, in order that a man may reap whatsoever he has sown, that reward may be given unto every man according to his works, that men may by their own free use or abuse of powers build up the fabric of their own destiny.

Our powers of instinct, passion, and emotion, and the power of will whereby we choose ends of action, are given in our constitution; open possibilities of good or evil lie before us; the working and development of these powers are in the hands of each individual for himself, and, under this nicely adapted law of habit, the permanent consequences of his conduct attach to each individual as his due reward. This court of justice differs from our ordinary tribunals. These are fallible, they are liable to the error of implicating the innocent with the guilty; they are inadequate to meet all cases demanding redress; they keep records, which may be lost, and attach penalties according to the standard of a written law, which may be misinterpreted; their decrees are never instantly carried into execution, but are generally delayed. This law of habit, however, is liable to no such imperfection in its application. It is infallible, as being prescribed by the primary source of all law. Before it the innocent, the guilty, "all men are equal." Its decrees cannot be reversed by appeal, they are carried out instantly upon the act. It immediately rivets into the constitution of every responsible creature the consequences of his action, recording his deeds neither against nor for him, but engraving them in him, in such a way that in the condition of his ultimate attainment may be read not only the just outcome, but also the infallible index of his life.

If the above apprehensions of the subject of habit be correct, some important consequences follow, among which might be mentioned the following:—If the stability and assurance of tendencies rest upon and are proportioned to their exercise, immediate conversions and unpremeditated changes of opinion cannot give a stability, purity, truth and strength of character such as is induced by long-continued practice in well-doing; and, as a reliable criterion for estimating character, a man's professed creed falls far below his habitual attitude of life.

These considerations suggest to us most important practical lessons, which the educator, whose function it is to train men, intellectually or morally, should never for a moment forget. The nature of *education* can be read in the etymology of the word; it consists of *drawing out* the powers, causing them to be energized, and directing them aright; and all our faculties, intellectual, moral or physical, are developed through the same law. It has been said that we may learn the whole secret of education in a gymnasium. Every organ to be trained is put into faithful exercise, and brought to the state desired, by being vigorously and frequently exerted. The powers of our higher nature are trained in the same way. Our emotional tendencies, our reasoning powers, our virtues, are developed through faithful exercise. Character itself is nothing other than the general result brought about by the course of action an individual has habitually chosen. A weak character, a strong character, a good or bad character, all these express merely different states of development which an individual has reached through habitual action. Each of the conquests, as also each of the failures made by him, stamps itself indelibly upon him, and the tendency at every step is toward a final fixed and immovable state. "The Battle of Life" has become almost a proverb, and its truth comes home to every heart in the consciousness of the inner struggle of contending forces, on the one hand the lower empirical instigations of the flesh, and on the other the moral ideal. In spite of all intelligent perception of the excellency of the moral law, in spite of approval, determination, and endeavour toward the right, the sorry absurdity of good opinions and bad life is often seen.

The rebellious organism and the insurgent passions may defeat all virtuous resolution. Knowledge alone is not sufficient. Theory and doctrine, and the inculcation of precepts, are no doubt well enough, they are in fact necessary in their place, but they are of no use unless supplemented by a practical training. They can never of themselves lead to the uniform habit of right action, and, unless aided by the practice of virtue, will be totally barren of results. There are many who approve of one course, and yet follow another. Their lives are truly battle fields where the struggle of opposing tendencies is still going on, and the struggle will cease only when frequent victory on either side has weakened and dissipated the resisting force, or brought it into regular submission. This necessity of a practical training in order to the attainment of the fixed state (ἕξις), called a virtuous character, is clearly expressed by Aristotle in the second book of the Nicomachean Ethics, where he speaks of men learning to be virtuous by practising virtue, just as they learn to build houses by building them, and to play on the harp by playing thereon.

The education of our voluntary powers of virtuous or vicious action is certainly of far greater importance as determining the destiny of the individual, than the education of the intellect. It is by overcoming that we learn to overcome, by obeying reason and the dictates of the moral law we learn to obey; and one single act of ours, whether it spring from principles within, or from authority, precept, or example, has a greater direct influence upon the development of character than all the mere theory in the world.

THIRD MEETING.

The Third Meeting was held on Saturday, 5th December, 1885, the President in the chair.

The following were elected members:—Herbert C. Rudge, Esq., A. C. Lawson, B.A.

The President reported that the committee appointed for the purpose of arranging for the admittance of the Natural History Society as a section of the Institute had successfully finished its labors. On motion of Mr. Bain, seconded by Dr. Cassidy, Dr. Ellis, Dr. Brodie, Prof. Loudon, Mr. Pearce and the mover were appointed a committee for the purpose of revising the Constitution and By-Laws for the establishment of sections and for arranging the minor details necessary for this purpose.

The following list of Donations and Exchanges was read:—

1. Canadian Practitioner, December, 1885.
2. Proceedings of the American Society for Psychical Research, Vol. I., No. 1, July, '85.
3. The American Naturalist, December, '85.
4. Proceedings of the American Philosophical Society, Vols. XVI-XXII., Nos. 97-120, and 11 Pamphlets.
5. American Chemical Review, Nov. 28. '85.
6. Journal of the Franklin Institute, Dec., '85.
7. Bulletin of the United States Geological Survey, Nos. 7-14.
8. Bulletin of the Museum of Comparative Zoölogy at Harvard College, Vol. XII., No. 2.
9. American Journal of Science, Dec., '85.
10. Proceedings of the Institution of Mechanical Engineers for March, 1885, from C. S. Gzowski, Esq.
11. Mémoires et Comptes Rendus des Travaux de la Société des Ingénieurs Civils, Juillet, '85, 52 numbers.

Mr. Alan Macdougall, M. Inst. C. E., F.R.S.E., read a paper on "Aërial Navigation."

The paper was an exhaustive treatise on the history of ballooning, or aërial navigation, from the earliest days down to the latest experiments of MM. Krebs and Renard in 1885. The conclusion the reader came to was that, so far as any success had been attained, it was more in the scientific than the commercial solution of the problem. The number of lives which have been lost of late years is not compensated for by any progress made in the practical solution of aërial navigation.

FOURTH MEETING.

The Fourth Meeting was held on Saturday, 12th December, 1885, the President in the chair.

The following list of Donations and Exchanges was read:—

1. Le Naturaliste Canadien, Vol. XV., No. 2.
2. Twenty-fifth Annual Report of the Museum of Comparative Zoology at Harvard College, for 1884–'85.
3. Science, Vol. VI., No. 148.
4. Proceedings of the American Association for the Advancement of Science, 22 Vols.
5. The Iowa Historical Record, Vol. I., No. 4.
6. Proceedings of the Cambridge Philosophical Society, Vol. V., Part 4.
7. Transactions of the Institution of Engineers and Shipbuilders of Scotland, 29th Series, 1885-'86.
8. Proceedings and Transactions of the Natural History Society of Glasgow, Vol. I. (N. S.), Part 1, 1883-'84.
9. Transactions of the Manchester Geological Society, Vol. XVIII., Pt. 11.
10. Papers read before the Manchester Association of Employers, Foremen, and Draughtsmen of the Mechanical Trades of Great Britain, 31st March, 1883—28th March, 1885, 18 Pamphlets.
11. Lotos Jahrbuch für Naturwissenschaft, Neue Folge, VI. Band, Prag.
12. Monatsblätter des Wissenschaftlichen Club in Wien, VII. Jahrgang, Nos. 1 and 2, Oct. 15—Nov. 15, '85.
13. Bulletin de la Société de Géographie de Paris, Nos. 1 and 2, 1885.
14. Comptes Rendus des Séances de la Société de Géographie, Nos. 1-17, '85.
15. Correspondenz-blatt der Deutschen Gesellschaft für Anthropologie, Ethnologie, und Urgeschichte, XVI. Jahrgang, No. 10, October, 1885.
16. Verhandlungen der Gesellschaft für Erdkunde zu Berlin, Band XII., Nos. 4, 5, 6, 7.
17. Sechster Jahresbericht der Geographischen Gesellschaft zu Hannover, 1884-'85.

18. Bollettino della Società Geografica Italiana, Ser. II., Vol. X., Novembre, 1885, Anni XIX., Fas. II., Roma.
19. Atti della Società Toscana di Scienze Naturali in Pisa, Memorie, Vol. VI., Fasc. 2, 1885.

Total, 74.

Mr. W. A. Douglass, B.A., read a paper on "Rent—a criticism of Professor Walker's work on that subject."

In this work the Professor explains what he believes to be the correct theory of rent and then criticizes the writings of Carey, Bastiat, Louis-Boileau and George on this subject. He proclaims himself a Ricardian of Ricardians. The general theory of the value of commodities as taught both by Ricardo and Walker teaches that value depends on two conditions—desirability and *scarcity*; but when they treat of land they both introduce a new theory of value, the conditions of which are desirability and *difference*. Why this additional theory is necessary neither explains, nor is such explanation possible, for the general theory, which makes rent or the value of land depend on desirability and scarcity, is quite sufficient. The Ricardian theory assumes that the best lands are first occupied, but as soon as population increases so that resort must be had to inferior lands, then the better lands yield as rent the difference between the productiveness of the superior over the inferior land. While this is true, the growth of land values in cities is due to another cause, viz., the increasing advantage of contiguity giving greater facilities for exchange and subdivision of labour. This force is unnoticed by Walker, and a most astonishing omission made by most writers on this subject is the enormous ground rents of large cities. Most writers confine their attention to rural districts, where the effect of rent as a factor in the distribution of wealth is least manifest. To discuss rent where it amounts to $5 per acre, and not notice it where it amounts to ten thousandfold that sum is one of the most remarkable oversights in the study of Economics.

When explaining the theory of rent Walker points out that while lands may differ much in productiveness, the portion of the product retained by the labourer will be equal on all qualities of land and will be the same as the product on the poorest lands cultivated. If competition be fully active between these locations the above statement may be accepted as correct. Here two considerations may be noticed: First—does not this give the clue to the correct doctrine of a wage fund? Say lands vary in fertility from 15 bushels upwards, then 15 bushels will be the wages of labour not merely on the free lands, but also on the most productive soils, and rent will take all the product in excess of 15 bushels. Second—Suppose population increases so that society must take in a lower quality of land, say a 12 bushel tract, then wages would fall to 12 bushels while rent will be increased by three bushels. Here we may notice, as pointed out by Ricardo, a movement of antagonism—the reduction of production, labor getting out of that reduced production a reduced proportion while rents increase. And it may be further noticed that increased rents mean not increased wealth but diminished wealth.

After an examination and refutation of the teaching of Bastiat in his Economic Harmonies that rent is payment for service, and after showing that Carey's criticism of the Ricardian theory is founded largely on a misapprehension of that theory, he then proceeds to examine the proposal of George that ground rent should be appropriated by the State. Walker gives his ready concurrence to the proposal of Mill that all future increase of ground rent should go to the State, if it were practicable, but he does not believe that the attempt would pay; but that the State should appropriate present rentals he repudiates as unjust. Here Walker seems to be inconsistent in his teaching. From his exposition of the Ricardian theory we see at once that to allow individuals to appropriate ground rents has the inevitable effect of dividing society into toilers and idlers, imposing the whole toil of the world on one part of the population and allowing the rest to enjoy lives of luxurious idleness; that it establishes an antagonism in society, an increase of population depressing the toilers and enriching the idlers; that it condemns the majority of mankind inevitably to lives of toil and poverty; that it places an everlasting barrier to the progress of a large majority of the race.

Dr. Meredith thought rent was the measure of the difference in productiveness of soils, but a soil near a city produces a greater rent than a soil of the same quality further off; the unearned increment is independent of the owner of the lands; land differs from all other commodities in some respects, and society has a right to modify its tenure; in personalty value depends on the labour put into it, but it is otherwise with land, Mr. Galbraith said labour is the source of all value, and money is the measure of value; Ricardo's metaphysical distinctions are of no use; in the market natural properties are worth nothing; it is the improvements that give value; the solution of the question as to land and value is to be found in the banking system; our banks convert capital into credit; capital and money are not the same thing.

Mr. Phipps could not see the difference between earning $100 and putting it at interest, and buying $100 worth of land and getting rent for it; it was payment for labour in both cases; he denied the reality of the unearned increment; we must allow men to accumulate property; this right is a security for society; without the desire to accumulate we would be savages.

The discussion was continued by Messrs. Bain, Browning, Marling, and others.

FIFTH MEETING.

The Fifth Meeting was held on Saturday, 19th December, 1885, the President in the chair.

The following list of Donations and Exchanges was read:—

1. **Annual Report of the Bureau of Industries, Province of Ontario, for 1884.**
2. **Boulder Clays, by Dr. G. M. Dawson, Geological Survey of Canada.**
3. **The Canadian Entomologist for Nov. '85.**
4. **Monthly Weather Review, Dominion of Canada, for Nov. '85.**
5. **Science, Dec. 11, '85.**
6. **Appleton's Literary Bulletin, Vol. IV., No. 6.**
7. **The Hoosier Naturalist, Vol. I., No. 5, Valparaiso, Indiana, Dec. '85.**
8. **The West American Scientist, San Diego, California. Nos. 3, 4, 5, 6, 7, 8, 10, Feb.—Oct., '85.**
9. **The Iowa Historical Record, Vol. I., Nos. 1, 2, 3, Jan.—July, '85.**
10. **Collections of the Georgia Historical Society, Vols. 2, 3, 4 Savannah, 1842—1878.**
11. **Proceedings of the Physical Society of London, Vol. VII., Parts 1, 2, July and Oct., 1885.**
12. **Proceedings of the Royal Physical Society of Edinburgh, Vol. VIII., Part 2, Sessions 1884–85.**

13. Proceedings of the Royal Geographical Society for Dec., '85.
14. Scottish Geographical Magazine, for Dec., '85.
    Report of the Council of the Scottish Geographical Society, Sessions 1884–85.
15. Reports of the "Ballad," "Chaucer," and "Early English Text" Societies.
16. Report and Proceedings of the Belfast Natural History and Philosophical Society for Sessions 1884–85.
17. Lectures on the Theory and Practice of Hydro-Mechanics, delivered at the Institution of Civil Engineers, London, Sessions 1884–85.
18. Archivio per l'Antropologia e la Etnologia, Quindicesimo Volume, Fascicolo Secondo, Firenze.
19. Cosmos di Guido Cora, Vol. VIII., Parts VIII., IX., 1884.
20. Electricité: Revue Hebdomadaire for 28 Nov., '85.
21. Naturhistorisches Museum zu Hamburg, Bericht, 1885.
22. Bollettino di Bibliographia e di Storia delle Scienze Matematiche e Fisiche, Tomo XVIII., Gennaio e Febbraio, 1885. Roma.
23. Compte Rendu des Séances de la Commission Centrale de la Société de Géographie, No. 18, Paris, '85.
24. Bulletin du Musée Royal d'Histoire Naturelle de Belgique, Tomes I., II., III., 1882, 1883, 1884–85. Bruxelles.
25. Mittheilungen der Anthropologischen Gesellschaft in Wien, XV., Band 1 Heft. 1885.
26. Catalogue Wisconsin State Historical Society, Vols. 1—6, 1873—1884.
    Wisconsin Historical Collections, Vol. IX., 1880—82.

Mr. George S. Hodgins was elected a member.

Mr. Wm. Houston, M.A., read a paper on "The Village Community in Modern Politics," of which the following is a summary:—

The term "Village Community" has now amongst writers on political science a well-understood meaning. The institution connoted by it is of very ancient origin, being traceable in its essential features as far back as investigations have yet been carried with anything like definite results. It is also very wide spread, being common to at least all the Aryan peoples. It would have been surprising if a social institution so ubiquitous and persistent had not left numerous traces of its influence on the modern political institutions of even highly civilized Aryan nations, and as a matter of fact it has done so. To call attention to some of the modern "survivals" of the Aryan village community is the purpose of this paper. The proper method of investigation in a matter of this kind would be the inductive one. Existing political institutions, especially such as are of a local character, should be analysed, and the history of their various essential features should be traced back until we arrive at the most original forms. But as this method cannot advantageously be applied within the limits of a single paper, I must begin at the other end of the series—that is, define the ancient* village community, and briefly point out some modern institutions that are clearly traceable to it.

A few words on the bibliography of this question. From a comparatively early period in the British occupation of India the village community was noticed by the East India Company's officers, but its essential features were not well understood, and this want of perception led to many disastrous blunders in their administration. Sir Henry Maine, one of the most eminent of English publicists and jurists, was the first to discern the real character of the organization of native Indian society. Prior to his Indian experience he had, through the investigations of Nasse and others, become acquainted with the traces left by the village community on the political and social institutions of the Teutonic countries of Europe, including England. With the eye of genius he soon discerned that the Indian "village" and the British and Teutonic "village" were in their essential features identical, and this at once suggested to him that they must have had a common origin. In a series of lectures on "Village Communities East and West," delivered at Oxford in the year 1871, he enunciated his theory and thus gave an entirely new and most fruitful impulse and direction to historical investigation and the science of comparative politics. Since that time the "Aryan village in India and Ceylon"—that is, the modern Aryan village as seen in those countries to-day—has been elaborately described by Sir John Phear. Seebohm, Gomme, Hearn, Coulanges, and others have followed the subject up comparatively and systematically, while various descriptive writers have incidentally thrown much light on the communal institutions of the countries described. The information contributed in the latter way by Mr. Wallace in his account of Russia was peculiarly valuable and timely, for the Russian "mir" delineated in his pages is beyond all question substantially identical with the English "township" and the German "village."

It is not easy to define, or even briefly describe, the "village community," for it took widely differing forms in different countries and at different periods in the history of each country. A comparative study of these forms, however, shows that a typical Ayran village is marked by several easily recognized features, of which the following are the most important:—(1) Community of land-holding, (2) customary law, (3) assembly-government in the community, (4) patriarchal authority (*patria potestas*) in the family, and (5) caste. Of these the last two may be passed over with a mere mention, for though they profoundly affect the constitution of modern society even in our own country they do so in ways that are not usually regarded as "political." A "village community," then, may be described as a composite political unit made up of a number of "households," each of which is presided over by a patriarch. The affairs of each household are managed by the household itself under the authority of the *paterfamilias*, no outsider having any right to so much as enter its precincts unbidden. The land included within the village boundaries is divided up amongst the households, each plot being held by the whole household in common, and individual ownership in land being unknown. An additional area of land outside is held by the households in common, no household owning any one portion, and the area being allotted and re-allotted from time to time in accordance with traditional customs, and under the collective authority of the heads of households. All affairs relating to the community as such are transacted under the same authority, for representative government is as absolutely unknown as individual property in land. There are no enacted laws, and no prescribed punishments. Custom is the only law, and assassination and "boycotting" are the only sanctions. If a member of a household resists the patriarchal authority, that authority is left to deal with him. If a member of the community violates its customs, he is put to death when the offence is serious enough, and in other cases is tabooed, or isolated, or "boycotted."

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* The term "ancient" must not be understood absolutely in this connection, for to this day the village community exists in India, and even in some parts of Europe, in exceedingly primitive forms. Indeed the term "primitive" expresses more accurately than "ancient" the dea intended to be conveyed.

From the institution of the village community thus imperfectly outlined have been developed our modern municipal government, our administration of justice, and our various forms of land tenure. What institutions of a social kind preceded the village community need not concern us in this inquiry. We need not care whether the village was the result of the fissiparous division of a nomadic horde or of the aggregation into a group of a number of households. It is sufficient for our purpose to know that over Europe and a large part of Asia it was practically universal, and that in India, Russia, the Slavonic portions of Turkey in Europe, and some parts of Germany, it exists to the present day with its essential features well preserved. Even in Great Britain and Ireland some of these features are quite discernible. The folk-moots, allotments and re-allotments of land, commons, and other local institutions and customs in England; community of tenure of land in Scotland; the sept in Ireland, and the gavelkind in Kent are all survivals of the Aryan village community. The keen and persistent desire of the peasant to own a piece of land—the "land-hunger," as it has been well called—is not a desire of modern growth. It is rather a survival from a time when the peasant had a real share in the ownership of the land, when, though there was no part of it which he could claim permanently as his, there was no part of the common area in which he had not as much proprietary interest as his neighbor. Less than two hundred years ago there were large areas of commons scattered over England. Much of this land has been enclosed and handed over to private owners under the authority of Acts of Parliament. It is doubtful whether the people of the various localities, the real owners, were ever reimbursed for their loss; it is quite certain that the sense of their loss has never died out, and that this feeling is strong enough to give effect to the clamour for allotments, facetiously designated as a demand for "three acres and a cow." Even the practice of "boycotting," now so frequently resorted to in Ireland, is not a modern device, but a survival, telling us of a time when the ordinary method of punishing a man for practices obnoxious to his neighbors was to "send him to Coventry."

In the days of Charles I., the village community had more of its features in a state of sound preservation in England than it has now. Worthy of special notice is the government of local affairs by means of local assemblies of the people. This custom was transplanted to New England by the Puritan exiles, and on the virgin political soil it grew and flourished. The well-known New England "town meeting" is the direct offspring of the Old England folk-moot. In the Puritan colony each little district managed its own local affairs by means of public meetings in which each head of a family had the same authority as every other, and in many of them a portion of the public domain was held in common and occasionally, if not periodically, re-allotted. In course of time some of the "towns" grew so large as to be unwieldy under the general-assembly system, and administration of town affairs by "select-men" filled up the interval between the yearly meetings of the general assembly. At the time of the Revolution, Boston, with 50,000 of a population, was still an old-fashioned town, the leading spirit in its turbulent *rôle* at that time being "Sam Adams, the man of the Boston town-meeting." The transition from town-meeting to representative municipal government was, with a people remarkable for their ingenuity, natural and obvious, and municipal institutions thus organized spread rapidly over the middle and western states, being carried everywhere in embryo by the migrating New Englander, as the seeds of plants are carried by a variety of unconscious agencies. Nearly half a century ago they came into Canada also, and from that time to the present we have been developing this survival of the Aryan village, seldom taking a thought of the antiquity of its origin. Our public nomination of mayor in the municipal election is a "town-meeting," and our submission of money by-laws to a vote of the taxpayers is a relic of the practice of voting the appropriations for the year in a general assembly of the "town" house-holders.

In other ways modern Canadian institutions have been affected by the village community. The Mennonites who took up their abode a dozen years ago on the Manitoba plains brought with them their primitive village organization, and they have shown themselves reluctant to abandon it. A few years later, when the Manitoba legislature created a system of municipal government for that Province, the Mennonites would have nothing to do with it. Instead of each owner building a homestead on his own farm the dwellings were erected in groups, while the land, owned individually, was nevertheless farmed in common.* During the lifetime of the present generation, if not for a longer period, the Canadian student of comparative politics will be able to investigate the "village community" in a very primitive stage of development without leaving his own country.

When the French colonists settled in Quebec they brought with them institutions and practices that were almost certainly an outgrowth of the "village community," modified by feudalism. The seigniories may be specified amongst the former; the practice of grouping their dwellings together on the river banks amongst the latter. I am not aware that community of ownership of land prevailed at any time to a large extent, but traces of it are clearly discernible in the French settlements in the Northwest. The right to cut hay and fuel on land not owned by any one individual was conceded to each member of the little settlement, while its internal affairs were managed to some extent at least on the old community plan. Without raising the question, whether the Metis were justified in their uprisings on the Red River and the Saskatchewan, there can be no doubt that each of these *émeutes* was due largely to the dislike of the simple villagers to the introduction of the square-lot system, and to their dread of interference with the river-front arrangement which suited so well alike their habits of life and their stage of political development.

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* The community system seems to have received a fatal blow through a gross breach of faith on the part of one of the owners, on whose lot several people had built their homesteads. He lately claimed all their houses as his because they were on his land, and whether he succeeds in holding them or not each owner is likely to build hereafter on his own property. While the dishonesty is regrettable the impulse given to individualism is not.

Mr. VanderSmissen related from Immermann's Oberhof an incident showing the strong tenacity with which men cling to ancient institutions.

Mr. Browning, from his recent observation in the North-West, made some remarks on the ownership of land among the Indians. Not being agricultural, but nomadic, they did not exercise the right of proprietorship of the soil. The Crees were the only exception. He gave an account of the ceremonies he had witnessed at the adoption of an individual from another tribe. He then referred to the change made in Scotland by the expropriation of land by the landlords who from the heads of clans became feudal lords.

Mr. Livingston took exception to some of the statements made by Mr. Houston, and gave some instances that came under his observation of the serious trouble caused to settlers by the enforcement of the land regulations of the North-West.

Mr. Boyle replied to Mr. Livingston's remarks.

Mr. Rouse made enquiry respecting the village community in Russia.

Mr. Houston replied that Russia afforded the most perfect example of the existence of the village community.

Mr. Phipps corroborated Mr. Houston's statement respecting the village communities in Russia. He called attention to the absence of reference to the village communities in the documents of the reigns of Henry I., Stephen, and other early English kings; and made some observations on the changes of the tenure of land in Scotland owing to the rebellion of '45.

SIXTH MEETING.

The Sixth Meeting was held on Saturday, 9th January, 1886, the 2nd Vice-President in the chair.

The following list of Donations and Exchanges was read:

I.—CANADA AND THE UNITED STATES.

1. Le Naturaliste Canadien, Dec., 1885.
2. The Canadian Practitioner, Jan., 1886.
3. Science, Vol. VI., Nos. 150, 151; Vol. VII., No. 152.
4. Transactions of the American Society of Civil Engineers, Nov., 1885.
5. Bulletin of the California Academy of Sciences, Nos. 1, 2, 3.
   Illustrations of the Zygænidæ and Bambycidæ of North America, by Richard H. Stretch, Vol. I., Parts 1—9.
   Four Pamphlets on Early Migration, by Charles Wolcott Brooks, 1876—'84.
   Proceedings of the California Academy of Sciences, 2 Pamphlets, 1880–81.
   Catalogue of the Pacific Coast Fungi, 1880.
6. Magazine of American History, Jan. 7, '86.
7. Johns Hopkins University Circular for December, 1885.
8. The Apparent Position of the Zodiacal Light, by Arthur Searle.
9. American Journal of Science, January, '86.
10. The American Naturalist, January, '86.
11. Essex Institute Historical Collections, Vol. XXII., Nos. 4, 5, 6.
12. Third Annual Report of the Bureau of Ethnology, 1881–82, Washington.
13. Journal of the American Chemical Society, Vol. VII., No. 9, Nov. 1885.
14. Journal of the Franklin Institute, January, 1886.

Total, 26 numbers.

II.—GREAT BRITAIN, IRELAND AND INDIA.

1. The Midland Naturarist, Dec. 1885.
2. Proceedings of the Royal Society, Vol. XXXIX., No. 239.
3. The Scottish Geographical Magazine, Vol. I, Nos. 1—3.
4. Monthly Notices of the Royal Astronomical Society, November, 1885.
5. Transactions of the Institution of the Civil Engineers of Ireland, Vol XV.
6. Transactions of the Institution of Engineers and Shipbuilders of Scotland, 29th Sess., 1885–86.
7. Journal of the Royal Microscopical Society, December, 1885.
8. Journal of the Transactions of the Victoria Institute, Vol. XIX., Part 3.
9. Proceedings of the London Mathematical Society, Nos. 250—252.
10. Proceedings of the Asiatic Society of Bengal, Nos. VI., VII., VIII., June—August, 1885.
    Journal of the Asiatic Society of Bengal, Vol. LIV., Part II., Nos. 1, 2, 1885.

Total, 14 numbers.

III.—FOREIGN.

1. Electricité, Vol. 9e. Nos. 49, 50, 51.
2. Annales de l' Ecole Polytechnique de Delft, 1re et 2me Livraison, 1884-5.
3. Annales des Mines, Tome VIII., Part 4.
4. Archives Néerlandaises des Sciences Exactes et Naturelles. Tome XIX. Liv. 3me. Tome XX., 3me Liv.
5. Bulletino della Sezione Fiorentina della Società Africana d' Italia. Anno I., Fasc. 5.
6. Actos de la Academia Nacional de Ciencias en Córdoba, Tomo V., Enta. 1, 2.
7. Cosmos, Nos. 46, 47, 1885.
8. Monatliche Mittheilungen des Naturwissenschaftlichen Vereins des Regierungsbezirkes Frankfurt an der Oder. 3 Jahrgang, Nos. 1—8. April—Nov., 1885.
9. Verhandlungen des Naturhistorisch-Medicinischen Vereins zu Heidelberg. Band III., Heft 4.
10. Commentari dell ' Ateneo di Brescia per l' Anno 1885.
11. Bollettino della Società Entomologica Italiana, 1883, 1884, 1885, 8 parts.
12. Bulletin de la Société de Geographie, 3e Trimestre, 1885.
13. Archivio di Letteratura Biblica ed Orientale. Anno VII., No. 1—11.
14. Journal des Sociétés Scientifiques. Nos. 50 et 51, 1885.
15. (1) Monatsblätter des Wissenschaftlichen Club in Wien, VII. Jahrgang No. 3.
    (2) Beiträge zur den Monatsblättern des Wissenschaftlichen Club in Wien, 15 Octr., 1885.
16. (1) Zeitschrift des Historischen Vereins für Niedersachsen, 1885.
    (2) Leibnizens Entwürfe zu seinen Annalen von 1691 und 1692.
    (3) Afrika auf der Ebsterfer Weltkarte.
17. Le Syllogue Littéraire Grec de Constantinople.
    Συγγραμμα Περιοδικον. Tomes 19′.
    Παρατηματα. 3 Nos., *του* T. 19′.

18. Bulletin du Musée Royal d' Histoire Naturelle de Belgique. Tome IV., No. 1.
19. Mémoires de la Société Nationale des Sciences de Cherbourg, Tome XXIX.

Catalogue 2 Partie, 3 Liv. 57.

Total 97 numbers.

The following were elected members: W. H. C. Kerr, M.A., Wm. H. Knowlton, James Goldie.

Mr. T. Nelson Dale read a Paper on "New England Upper Silurian."

Mr. Dale gave a general account of visits made by him to the well-known localities of Bernardston, Mass., and Littleton, New Hampshire, under the direction of Prof. Raphael Pumpelly of the North Atlantic Division of the U. S. Geological Survey.

At Bernardston, Mass., a bed of an impure crystalline crinoid limestone, associated with magnetite, garnets, chlorite, mica, pyrite and limonite, dips under a thin-bedded quartzite and a garnetiferous mica schist which are unconformably overlaid by the Triassic Sandstone of the Connecticut River Valley. The limestone has generally been regarded as Lower Upper Silurian or Upper Lower Silurian.

At Littleton, N. H., a more or less argillaceous crinoid limestone containing Favosites, Halysites, Pentamerus, etc., and associated with slates, some of which contain Trilobites, overlies a more or less schistose Protogene, and is followed by a metamorphic sandstone.

The fossils at this locality are sufficiently numerous to permit an exact determination of the age of the beds. They have usually been regarded as Lower Helderberg.

Both localities are remarkable for the presence of somewhat recent Silurian rocks associated with rocks or minerals showing a high degree of metamorphism; and it would seem that careful paleontological and stratigraphical investigations at these and similar localities ought to throw light on the age of many rocks which, on account of their crystalline character, have been classified as azoic or placed in an uncertain group at the base of the Lower Silurian.

In answer to an enquiry of Mr. J. H. Hunter, whether any specimens of organisms had been found in the gneissoid rocks of the United States, Mr. Dale replied that he was not aware of any having been found in gneissoid rocks, but trilobites had been found in mica-schist.

Dr. Ellis made some remarks on the occurrence of beds of iron ore with limestone, and wished to know whether geologists had formed any theory as to the origin of ferruginous deposits.

Mr. Dale stated, that some ferruginous deposits might be direct products of erosion, as in the case of the magnetite which frequently occurs in beach sand in the vicinity of crystalline rocks, but that they were probably more often of a largely chemical origin. Geologists usually concerned themselves more about the chemical questions involved in the formation and alteration of ferruginous deposits than with the physical ones.

In answer to a question from Mr. Boyle, Mr. Dale said he had not found any specimens of crinoids over two inches in length ; the greater number of the specimens were much less. As to the species, it was generally considered that they were Upper Silurian.

Mr. Livingston called attention to the remarkable boulder near Mount Washington.

Mr. Dale said that the size and shape of the boulders would naturally be determined by the joints of the rock from which they originated. He illustrated how the rock would be broken into blocks by an experiment with a box of clay subjected to hydraulic pressure.

The President read the Report of the Committee appointed to revise the Rules and Regulations of the Institute, and gave notice that at a special general meeting to be held on 23rd January, 1886, he would move that the Rules and Regulations be amended in accordance with the Report of the Committee.

SEVENTH MEETING.

The Seventh Meeting was held on 16th January, 1886, the President in the chair.

The following list of Donations and Exchanges was read:

1. The Canadian Record of Science, Vol. II., No. 1.
2. Science, Vol. VII., No. 153, Jan. 8th, '86.
3. Transactions of the New York Academy of Sciences, Vol. III., 1883–'84, Do., Vol V., No. 1, October, 1885.
4. Journal of the Cincinnati Society of Natural History, Vol. VIII., No. 4, Jan., '86.
5. Report of the U. S. Coast and Geodetic Survey for 1884.
6. The Magazine of Western History, Vol. III., Nos. 1 and 3, November, '85, and January, '86.
7. Transactions of the Sanitary Institute of Great Britain, Vol. XI., 1884–'85.
8. Cosmos, No. 48, Dec. 28, '85.
9. Electricité, No. 52, Dec. 26, '85.
10. Bullettino di Bibliografia e di Storia delle Scienze Matematiche e Fisiche, Tomo XVIII., Marzo, 1885.
11. Compte Rendu de la Société de Géographie, Paris, Nos. 19, 20.
12. Journal des Sociétés Scientifiques, No. 52.
13. Bulletin de la Société Géologique de France, 3e Série, t. xiii., '85, No. 6.
14. Bulletin de la Société Géologique de Normandie, Tome IX., 1882.
15. Mémoires du Comité Géologique, Vol. II., No. 1, St. Petersburg.

Total, 17.

Mr. Arthur M. Stow was elected a member.

Mr. VanderSmissen, on behalf of Professor Campbell of Montreal, read a Paper entitled: "Etruria Capta." The First Part of this Paper has been published in Vol. III., p. 144; the Second Part is being revised by the author, and will appear in a subsequent issue.

After reading the paper and giving a brief resumé of the labours of Corssen, Lanzi, Bréal, Deecke and other leading Etruscologists, Mr. VanderSmissen proceeded to give illustrations of a few sepulchral inscriptions in the Etruscan character, to show the application of the key and the results produced, dwelling particularly on the translations of a few bilinguals, in which the Etruscan characters are accompanied by Latin ones.

Professor Campbell, however, not content with deciphering 101 brief inscriptions, also applied himself, in the second portion of his paper, to the Eugubine Tables, a document hitherto read as Umbrian, though written in the Etruscan character, and containing over 350 lines. This document was found to contain a long and complicated story of an Etruscan and Umbrian revolt, incorrectly related by Livy in the 36th chapter of book XXXIII. of his history of Rome. The remaining portion of these tables, also read as Umbrian, a dialect closely akin to Latin, but written in plainly legible Latin characters, was placed in the hands of Dr. McNish of Cornwall, whose attainments as a Celtic scholar were well known to the members of the Institute, and will shortly be presented to the world as the *oldest Celtic document* extant, being in a language closely connected with the Gælic. They deal with the same events as the Etruscan portions, and tell the same story from a different standpoint.

Mr. VanderSmissen then gave a brief estimate of the contents of the paper, and expressed strong confidence that Professor Campbell's method would ultimately establish itself as true.

In conclusion, Mr. VanderSmissen announced that Prof. Campbell had succeeded in reading, by the help of the same key, some Celt-Iberian inscriptions in a character which was but a variant of the Etruscan, and which had been sent to him by the Rev. Mr. Webster, of Bechienia, in the Basque country.

He regretted that he (Mr. VanderSmissen) had not been able, on account of his University work, to give the subject that attention its importance demands, but hoped to do so during the coming vacation and asked the co-operation of such members of the Institute as were interested in the subject.

EIGHTH MEETING.

The Eighth Meeting was held on 23rd January, 1886, being also a special general meeting pursuant to notice, the President in the chair.

The following list of Donations and Exchanges was read :

1. Monthly Weather Review, Dominion of Canada, Dec., 1885.
2. Report of the Committee, House of Commons, Canada, on Geological Surveys.
3. Science, Vol. VII., No. 154, Jan. 15, 1886.
4. Transactions of the New York Academy of Science, Vol. 5, No. 2, Nov. 1885.
5. University of Pennsylvania—Catalogue and Announcements, 1885-'86.
6. Bulletin of the American Geographical Society, No. 2, 1885, New York.
7. The Electrician and Electrical Engineer, New York, Vol. V., No. 49, Jan. 1886.
8. Electrical Review, Jan. 23, '86.
9. (1) Proceedings of the New Jersey Historical Society (Second Series), Vol. VIII., 1884-85.
   (2) New Jersey Archives (First Series), Vol. IX.
10. Journal of Speculative Philosophy for July, 1885.
11. West American Scientist, Vol, 1, Nos. 3 and 11.
12. Proceedings of the U. S. Naval Institute, Vol. XI., No. 4. (Annapolis, Md.)
13. The Illustrated Journal of Patented Inventions, Vol. I., Nos. 1—31. Nov. 28, 1884—June 26, 1885. Vol. II., Nos. 32—56, July 3, 1885—Jan. 8, 1886.
14. The Midland Naturalist, Vol. IX., Jan., '86.
15. Trübner's American, European and Oriental Literary Record, Nos. 217, 218.
16. Electricité, Vol. 10, No. 1.
17. Cosmos, No. 49.
18. Bollettino della Società Geografica Italiana, Ser. II., Vol. X., Fascicolo 12.
19. Crónica Cientifica, Barcelona. Año VIII., Num. 193.
20. Wochenschrift des Oesterreichischen Ingenieur und Architekten Vereines, XI. Jahrgang, No. 1, Wien.
21. Transactions of the Mathematical Society of Charkoff, 1885, Part I.

Total 78.

The Rules and Regulations, as revised by the special Committee, were then considered seriatim, and adopted as follows, to come into force at the next annual meeting :

REGULATIONS AND BY-LAWS OF THE CANADIAN INSTITUTE,

As amended at the Special General Meeting, January 23rd, 1886.

REGULATIONS.

SECTION I.

INCORPORATION.

The Canadian Institute is established under Royal Charter, granted November 4th, 1851.

SECTION II.

OBJECT.

The object of the Institute is the promotion of Pure and Applied Science.

SECTION III.

CONSTITUTION.

1. The Canadian Institute shall consist of Members and Associates.

2. There shall be three classes of members, *Ordinary*, *Life*, and *Honorary* members.

3. Ordinary members shall be persons whose pursuits or studies are connected with the Arts or Sciences, or who are desirous of forwarding the objects of the Institute.

4. Ordinary members may become life members by compounding their annual subscriptions by the payment of fifty dollars.

5. Honorary members shall be persons of high standing, who are eminent for their scientific attainments.

6. The number of honorary members shall be limited to twenty-five.

7. Associates shall have all the privileges of membership, except the right of voting, or taking part in the proceedings at meetings of the Institute or sections, or of receiving copies of the publications of the Institute.

8. For the promotion of the study of special branches of pure and applied science, the Institute shall be divided into such Sections as the Council shall from time to time determine subject to the subsequent approval of the Institute. Each Section shall frame its own regulations and by-laws subject to the approval of the Council.

9. The officers of the Institute shall be a President, a Vice-President, a Secretary, a Treasurer, an Editor, a Librarian, a Curator, and six members of Council, all of whom shall be elected annually by the members of the Institute.

SECTION IV.

THE ELECTION OF MEMBERS.

1. All persons desirous of being admitted into the Institute as members must be proposed at least one week before their election in accordance with a

form to be obtained from the Secretary, which form must be subscribed by at least two members of the Institute.

3. Honorary members must be recommended by at least three members, who shall certify that the candidate is a person eminent for his attainments in science.

3. Every recommendation of a candidate, as an honorary member, must be delivered to the Secretary, who shall submit the same to the Council for enquiry; and when the recommendation of such candidate is approved by the Council, it shall be signed by the Chairman, and read at the first following ordinary meeting previous to the ballot being taken.

4. All elections of members shall be by ballot and the proportion of votes requisite for the election of any person shall be at least three-fourths of the ballot.

5. Whenever any person is elected a member, the Secretary shall immediately inform him of the same by letter; and no person shall be considered a member of any class until he has signified his acquiescence in the election, and paid his first annual subscription.

6. If any complaint is brought against a member, the charge shall be considered by the Council in the first instance, and an opportunity shall be given to the accused to clear himself. If the Council consider it desirable, they shall call a special general meeting, of which, not less than a month's notice shall be given; and in case two-thirds of the members present at that meeting are of opinion that such member should be expelled, the presiding officer at that meeting shall declare him to be expelled.

SECTION V.

THE ELECTION OF OFFICERS.

1. The President, Vice-President, Treasurer, Secretary, Editor, Curator, Librarian, and six other members of Council shall be elected annually by ballot from amongst the members of the Institute, at the general meeting, on the first Saturday in May, and if that day falls upon a holiday, then upon the following Saturday.

2. Nominations for these offices must be made at the ordinary meeting immediately preceding the annual general meeting, and only those shall be eligible who have been so nominated.

3. Any member nominated to an office and not elected thereto, shall be eligible as a member of the Council.

4. At the annual election the Chairman shall appoint two scrutineers, who shall receive the votes of the members, count them, and report to the presiding officer, who shall declare the result to the members.

5. A separate ballot shall be taken for the President, for the Vice-President, and for each of the other officers, except the Councillors; and a ballot shall then be taken for the remaining six members of Council.

6. If in any case the votes are equal, the decision shall be by ballot.

7. Each section shall elect its own officers at the meeting of section preceding the annual meeting of the Institute.

8. The new Council shall enter upon their duties on the Saturday following their election.

9. Two Auditors shall be appointed at the ordinary meeting held on the third Saturday in March of each year; one by the members, the other by the Chairman.

SECTION VI.

MEMBERS' SUBSCRIPTIONS.

1. The annual subscription of each member residing in or within ten miles of the city of Toronto, shall be four dollars; and of each member residing elsewhere, two dollars. All subscriptions shall be due in advance on the first day of January, and all new members shall pay *pro rata* in advance until the thirty-first day of December next following the date of their election.

2. Every member shall receive a copy of the transactions and proceedings of the Institute published after his election so long as he shall continue in good standing.

3. Every member and associate shall be considered as belonging to the Institute, and, as such, liable to the payment of his annual subscription, until he has either forfeited his claim or has signified to the Secretary, in writing, his desire to withdraw, when his name shall be erased from the list of members.

4. No member or associate shall be entitled to any of the privileges of the Institute whose subscription shall be twelve months in arrear, and the name of any member whose annual subscriptions are two years in arrear may be erased from the list of members by the Council, and any member whose name is so erased shall cease to be a member of the Institute.

SECTION VII.

THE PRESIDENT, VICE-PRESIDENT, AND CHAIRMEN OF SECTIONS.

1. It shall be the duty of the President to carry into effect the regulations of the Institute. He shall preside at all meetings of the Institute at which he is present, and shall regulate and keep order in the proceedings.

2. In the absence of the President it shall be the duty of the Vice-President to preside at the meetings and regulate the proceedings. But in the absence of the President and Vice-President, the members present may elect one of their number to take the chair at such meeting.

3. The Chairmen of Sections shall preside at the meetings of their respective Sections.

SECTION VIII.

THE TREASURER.

1. The Treasurer shall keep an account of all the moneys of the Institute, and of all dealings therewith.

2. All moneys received for, or on account of the Institute, shall be paid over to the Treasurer, who shall deposit the same in one of the chartered

banks in the city of Toronto to the account and for the use of the Institute, unless otherwise ordered by the Council.

3. No money of the Institute shall be paid out except by order of the Council, and cheques shall be drawn in such manner as the Council shall from time to time direct.

SECTION IX.

THE SECRETARY.

1. The duty of the Secretary shall be to take minutes of all the proceedings of the Institute and of the Council, and enter them in the proper books ; to read at each meeting the minutes of the preceding meeting with a view to their verification, and subject to the direction of the Chairman, to bring before the meeting all business matters according to the order established by the by-law in that behalf. He shall also conduct the correspondence of the Institute.

2. The Secretaries of sections shall perform the functions of Recording and Corresponding Secretaries for their own Sections, unless the Section shall have appointed a Corresponding Secretary, in which case the Secretary of that Section shall perform the duties of Recording Secretary only.

3. The duties of the Assistant Secretary shall be defined from time to time by the Council.

SECTION X.

THE EDITOR.

The Editor shall have charge of the publication of the Proceedings of the Institute, in conjunction with an Editing Committee to be nominated by the Council from among its members at the first meeting thereof after the annual meeting. All papers or abstracts of papers read before the Institute and intended for publication shall be handed to the Editor at the close of the respective meetings at which they were read, or as soon as possible thereafter, and the decision as to the propriety or expediency of publishing any paper shall rest with the Editing Committee.

SECTION XI.

THE LIBRARIAN.

The Librarian shall have the care of all books, plans, drawings, and other documents, and shall have the general superintendence of the same, under the direction of the Council. He shall keep a list of all donations to the library in the order in which they are received, with the names of the donors.

SECTION XII.

THE CURATOR.

1. The Curator shall have charge of the museum, and of all models and specimens deposited therein, and shall have the general superintendence of the same, under the direction of the Council ; and he shall keep a list of all contributions with the names of the contributors.

2. The Assistant Curators shall be appointed by the Sections, and shall assist the Curator in the care of the museum and the specimens contained in it, so far as relates to their own departments.

SECTION XIII.

THE COUNCIL.

1. The Council shall consist of the President, Vice-President, the Chairmen of Sections, the Secretary and Secretaries of Sections, the Treasurer, the Editor, the Librarian, the Curator, and six other members, who shall have the direction and management of the affairs of the Institute.

2. The Council shall meet at least once a month during the session, or oftener if necessary, to conduct the business of the Institute.

3. Any two members of the Council may, by letter to the Secretary, require a special meeting to be called, and two days' notice of such meeting must be given to each member of the Council.

4. At any meeting of the Council five members thereof shall constitute a a quorum.

5. The Council shall have power to appoint Committees for special purposes, and such Committees shall report to the Council.

6. The Council shall present at the annual general meeting a report on the state of the Institute, in which shall be given an abstract of all the proceedings, and of the receipts and expenditures during the year ending March 31st next before such meeting.

7. In the event of any office becoming vacant before the annual general meeting, by death or otherwise, the Council shall have power to fill the vacancy; and in the event of any officer being unable to perform his duties, the Council shall have power to relieve him from the performance of such duties for the time being, and to appoint another member to act in his stead.

SECTION XIV.

THE AUDITORS.

The Auditors shall audit the accounts of the Institute for the year ending on March 31st next after their appointment, and they shall present their report to the Council at least one week before the annual general meeting.

SECTION XV.

THE ORDINARY MEETINGS.

1. The ordinary meetings of Sections shall take place at such times as may be agreed upon by the sections, subject to the approval of the Council.

2. The meetings of the Institute shall be at such times as the Council shall direct.

SECTION XVI.

SPECIAL GENERAL MEETING.

1. The Council may at any time call a special general meeting of the Institute on six days' notice in writing thereof to city members, which notice may be given either personally or transmitted by post to the last known address of the member.

2. It shall be the duty of the Council to call a special general meeting of the Institute at any time between October 1st and May 1st on being required in writing by at least twelve members to do so.

SECTION XVII.

THE ANNUAL GENERAL MEETING.

The annual general meeting of the Institute shall be held on the first Saturday in May of each year, at twenty o'clock (eight o'clock in the evening), for the purpose of receiving and considering the Report of the Council on the state of the Institute, and electing the officers and members of the Council for the ensuing year.

SECTION XVIII.

BRANCH SOCIETIES.

Members of the Institute residing at a distance of ten miles from the city of Toronto shall have power to form themselves into branch societies for the purpose of holding meetings and discussing subjects proper to the objects of the Institute, and such branch societies shall be governed by such by-laws as the Council may from time to time enact for such purposes.

SECTION XIX.

ALTERING THE REGULATIONS.

A motion to alter any by-law or regulation of the Institute may be made at the annual general meeting or a special general meeting called for the purpose, and not otherwise; and notice of the proposed alteration shall have been given at two consecutive ordinary meetings prior thereto.

SECTION XX.

THE PROPERTY OF THE INSTITUTE.

1. The whole of the property and effects of the Institute, of what kind soever, shall be vested in the Council of the Institute and subject to its control.

2. Every paper, map, or drawing, which may be presented to the Institute, shall be considered the property thereof, unless there shall have been some arrangement to the contrary, and the Council may publish the same in connection with their transactions, or, with the consent of the author, in any other form. No communication made to the Institute shall be published by any other person but the author without the previous consent of the Council.

3. Every paper presented to the Institute for publication shall be referred to an Editing Committee appointed by the Council. Notices or abstracts of all papers not published in full shall be prepared by the Editing Committee.

4. No papers, plans, maps, or other property belonging to the Institute, shall be taken out of the rooms thereof without the consent of the Council; but every member shall have a right to inspect the same at such hours as the Council may appoint.

SECTION XXI.

DONATIONS AND BEQUESTS.

1. The names of all persons who shall contribute to the library, or the general fund of the Institute, shall be read at the annual general meeting, and such persons shall be recorded as benefactors in the published transactions of the Institute.

2. Every person desirous of bequeathing to the Institute any manuscripts, books, maps, plans, drawings, instruments, geological, botanical, or other specimens, natural curiosities, works of art or manufacture, or personal property, is requested to make use of the following form in his will, viz.:—"I give and bequeath to the CANADIAN INSTITUTE, incorporated by Royal Charter, November 4th, 1851 (*here enumerate and particularize the effects or property intended to be bequeathed*), and I hereby declare that the receipt of the Treasurer of the said Institute for the time being shall be an effectual discharge to my executors for the said legacy."

BY-LAW.

At the ordinary meetings of the Institute, the following order of business shall be observed as closely as circumstances will admit:—

1. The minutes of the previous meeting shall be read and confirmed, and signed by the Chairman; and no entry shall be considered valid until this is done.
2. Nomination of candidates for admission.
3. Business arising out of the minutes.
4. Communications received since last meeting.
5. Donations received.
6. Communications from the Council.
7. New business.
8. Election of Candidates. A ballot shall be taken for the entire body of candidates proposed for admission; if one-fourth or more black balls appear, the ballot shall be taken for each individually; and any candidate shall be rejected against whom appear a number of black balls equal to one-fourth of the number of members voting.
9. The reading of papers.

Dr. Joseph Workman read a paper by Dr. Giuseppe Seppilli of Imola, Italy, on "Hypnotism." This paper has appeared in "The Alienist" for July, 1886.

Mr. VanderSmissen related various instances of hypnotism that had come under his observation, several of which were identical with those mentioned in the paper. The patients imagined themselves in the state suggested by the operator, and acted in character just as if the ideas were brought by the senses from without. Of the reality of the states thus induced there could be no doubt. He enquired whether it would cause death if it were suggested to the mind of the patient that prussic acid had been administered to him.

Dr. Workman thought that it would not. Other cases of hypnotism were related by members similar to those referred to in the paper.

Dr. Cassidy called attention to the curious phenomena exhibited by the Jumpers among the French Canadians, and related a case where a medical gentleman had tested a party of French Canadian "jumpers" in the State of Maine, from which it appeared that it was not necessary to be *en rapport* with the persons, but that simple suggestion on the part of any one was sufficient to produce the phenomena.

Mr. Rouse referred to the marks produced on the body by the action of the mind, as in the case of pregnant women, on whom the figures of fruit, as strawberries, of animals, as the face of a cat, &c., appear. Other instances were mentioned by some of the members. The stigmata on ecstatics were referred to in this connection, and instances given similar to those in the case of Francis of Assisi, Clara di Pugny, Louise Lateau and others, in ancient and modern times, the reality of which could not be doubted. They were supposed to be caused by the person being placed in a state of intense expectancy, the attention being strongly concentrated on some part of the bodily organization.

NINTH MEETING.

The Ninth Meeting was held on 30th January, 1886, the President in the chair.

Messrs. Notman and Bain were appointed representatives of the Institute on the Council of the Toronto Industrial Exhibition Association.

The following list of Donations and Exchanges was read:

1. **Le Naturaliste Canadien, Janvier, 1886.**
2. **Science, Jan. 22, '86.**
3. **Transactions of the American Institute of Mining Engineers, Vol. XIII., February, 1884 to June, 1885.**

4. Contributions from the E. M. Museum of Geology and Archæology of Princeton College, N. J., No. 1, Sept., 1878.
   Bulletin No. 3, May, 1883, Vol. I., No. 1, July, 1884.
   3rd and 4th Annual Reports, June, 1884 and June, 1885.
5. The American Naturalist, Feb. 1886.
6. Monthly Notices of the Royal Astronomical Society, Vol. XLVI., No. 2, Dec., '85.
7. Proceedings of the Royal Geographical Society, Vol. VIII., No. 1. Jan., '86.
8. Scottish Geographical Magazine, Vol. II., No. 1.
9. Historisches Jahrbuch der Görres-Gesellschaft, VII. Band, 1 Heft. München, 1886.
10. Electricité, 9 et 16 Janvier, 1886.
11. Wochenschrift des Oesterreichischen Ingenieur und Architekten-Vereines 8 Januar, '86.
12. Journal des Sociétés Scientifiques, 13 Janvier, 1886.
13. Archivio di Letteratura Biblica ed Orientale, Anno VII., No. 12. Dec., 1885.
14. Verhandlungen der Berliner Gesellschaft für Anthropologie, Ethnologie und Urgeschichte, Sitzungen vom 20, 27 Juni und 18 Juli, 1885.
15. Verhandlungen der Gesellschaft für Erdkunde zu Berlin, Band XII. Nos. 8, 9, 10.
16. Correspondenz-Blatt der deutschen Gesellschaft für Anthropologie, Ethnologie und Urgeschichte, XVI. Jahrgang, Nr 11, Nov., 1885.
17. Transactions and Proceedings of the Technical Society of the Pacific Coast, Vols. I. and II., 1884 and 1885—14 Nos.

Total 39.

Mr. S. C. Duncan-Clark was elected a member.

Mr. J. Davies Barnett read a paper on "The Mechanical Value and Treatment of Hard and Soft Coal."

To-day wood fuel is so scarce, and in quality so inferior, that it cannot even in Canada be extensively used for industrial purposes. In the year 1851 experiments by the Pennsylvania Central Railway on the evaporation of water showed that one ton of best soft coal (Pittsburg) was only equal to 1¾ cords of best hard wood; but afterwards, as the use of coal became better understood, the accepted relative proportion was 2 to 1; and, of wood of the general average quality now attainable, it will take 2¼, and even 2½, cords to do the work of one ton of good soft coal, if the coal is properly handled.

Our native peat—bulky and loose in texture—is out of the competition as a solid fuel; due, primarily, to the short season in which it can be cured naturally, or to the extensive plant required, if cured artificially.

Possessing—as peat does—so large a proportion of volatile combustible matter, it will in Canada eventually be used by conversion on the spot into gaseous fuel, conveyed through pipes, and consumed where required in some form of regenerative furnace, or exploded in the cylinder of a gas-engine.

Therefore, the manufacturer's choice in fuel, this year, is between the two coals—anthracite (hard) and bituminous (soft); and the first question that arises is. What is their relative value as fuels, say for making steam ? and does the larger percentage of carbon in hard coal justify its current high reputation and the top market price ?

Our answer is no ! certainly not ; and the general opinion (sometimes strongly stated), that pound for pound hard coal is the better fuel, is due to a crude comparison of elementary assays, rather than to practical tests carried out under every-day working conditions.

Analysis shows as high as·94 per cent. of fixed carbon in American hard coal, in comparison with 70 to 80 per cent. of fixed and volatile carbon in soft coal ; and, as the oxidation of this carbon is the main source of all furnace heat, there would seem to be a good basis of fact to support the common opinion.

Such inference, however, neglects to take into consideration the physical (molecular) condition of the coal.

Heat being vibration, the more dense and compact the atoms of the fuel, the greater is the percentage of the whole amount expended (commercially wasted) in raising the remainder to that state of freedom in which it can swing freely, or, in other words, the utilizable calorific value of carbon per unit weight varies inversely as its density. This holds good for every form of carbon, so that, as for instance in the diamond, the known condition in which molecular compression is greatest, its calorific value is very low.

Another reason why coal should not be valued and purchased on analysis as we would purchase metallic ore, is, that the law of union under which the various and variable substances forming coal originally united, and now separate—or recombine in distillation on the fire-grate,—is not seen clearly enough to permit of its power being gauged by simple analysis ; and there are experiments that lead to the conclusion that C and H united as in some coals have higher calorific powers than when uncombined. This is so difficult to conceive—seeing that in combination they possess no apparent explosive power—that Messrs. Kestner and Meunier's experiments, extending from 1868 to 1871, with their uniform results proving either higher powers in combination, or the incorrectness of the generally accepted formula, are not accepted as reliable.

For information and figures, giving us the results of continued experiments, enabling comparison to be made between the evaporative duty of Pennsylvania hard and soft coals, our thanks are due to T. N. Ely, General Superintendent Motive Power, Pennsylvania Railway, and to F. E. Wootten, General Manager of Philadelphia and Reading Railway.

On the Pennsylvania Railway, for *local* passenger trains, it takes to haul one coach per mile, 10.44 lbs. of soft coal and 13.85 lbs. of hard coal, being an increased consumption of 30 per cent. of hard coal, to do exactly the same work.

On *through* passenger runs, per car mile, 8.64 lbs. of soft and 11.55 lbs. of hard, an increase in consumption of 29 per cent. These figures are reliable—under the given conditions, and with ordinary proportions of fire-grate—being averages covering four months' work, and on the through runs, with five engines burning each class of fuel.

If, however, the boiler is arranged so as to give several hundred per cent. increase in fire-grate area, the actual difference in duty performed has been reduced by Mr. Wootten to nine-tenths of a pound of water evaporated per pound of fuel, hard coal recording 6.1 lbs., and soft coal 7 lbs. Thus, it requires almost 15 per cent. more hard coal to do the same evaporative work, even with this excessive increase in grate surface.

It should not, in our consideration, be forgotten, that the first cost of the locomotive type of boiler to consume hard coal is increased from 10 to 25 per cent, dependent on the excess of grate area allowed; and its total lease of life, when using hard coal, is variously stated at from eight-tenths to six-tenths of that of a boiler using soft coal, but in all other respects doing similar daily work.

No doubt there are boilers in which hard coal will give a higher evaporative duty than in locomotive practice, as also will soft coal; but the circumstances controlling the test must always be fully considered in making any direct comparison of figures, and, if possible, the conditions made equal and similar, otherwise it is possible for peat, used under favouring circumstances, to give a higher evaporative result per pound than coal used under unfavourable conditions.

In the careful tests of native coal, made for the English Government by Sir H. de la Beche and Dr. (now Sir) Lyon Playfair, there were eleven examples of soft coal that gave higher evaporative results than the single good anthracite tested, although this particular hard coal, in addition to having the highest per cent. of carbon, had also 3.46 per cent of hydrogen, being about three-fourths of the average amount of hydrogen in the various soft coals tested. This was very much in its favour, as the calorific value of hydrogen—by weight—is more than four times that of carbon ; however, its specific gravity was 1.375, being heavier than any other coal, native or foreign, then tested; and, it is, we think, only in the fact that its particles were so closely packed together, that the explanation of its comparatively low power can be found. A general average, taken over a large number of samples, shows American anthracites to weigh 400 lbs. per cubic yard heavier than British anthracites.

Outside of metallurgical operations, hard coal for manufacturing purposes has apparently nothing but its cleanliness to recommend it; and, presumably, it is for this benefit that the Toronto Water Works pays with satisfaction fuel bills that are unduly heavy.

Having thus narrowed our subject down to the consideration of the exclusive use of bituminous coal, we will briefly review the four different practices (which include the main modern theories) covering its economical combustion, using the names of the several advocates: Crampton, Mallett, Howden and Siemens, to identify their systems.

1st. CRAMPTON.—For the easier understanding of this system, we will premise by stating that the known *forms* in which fuel exists are three:—First, solid, either as lumps or dust; second, fluid, as oils, either flowing or in the form of spray; and, third, gaseous, either simple or mixed, say with oxygen, so as to be more or less explosive.

When fuel is in the lump form, oxygen can come into contact with but a very limited portion, viz.: the outside, or surface of each piece. This, when the lumps are large, results in slow combustion, and the passage of a wasteful excess of cooling air through the furnace; hence, careful stokers (and careless ones, when in competition,) break the pieces small before putting coal on the fire, and for the same reason that we use chips in starting a fire, and choose small wood when a quick fire is required for an early breakfast. But if (as in the Crampton method) the coal is reduced to dust, then steadily and uniformly fed into the furnace, by blast, with the air supply limited to little more than that absolutely required for chemical combination —say 13 lbs. of air per pound of solid fuel—perfect and smokeless combustion and an intense heat are attained, with the additional advantage that a refuse fuel of low price can be utilized, with corresponding economy.

Even with this form of fuel, the oxygen has but surface contact with the dust, as with the lumps; but the surface, per unit weight, is increased so enormously that the speed of burning closely approaches that of explosion.

An increased evaporation of 22 per cent. has been obtained by the use of pulverized coal; in part due to the very small excess of air requiring to be warmed, and in part to the higher temperatures attained. Not only for the evaporation of water is high temperature an advantage, but, as the speed of heat transmission through metal plates increases (approximately) as the difference between the squares of the different temperatures on the fire and water sides of the plates, the speedier the transfer, the less is the amount of absorbent surface to be provided. Therefore, the dust-fuel system permits the construction of a smaller boiler to develop the same horse-power, but it has the disadvantage of requiring mechanical stoking and mechanical disintegration of fuel. Mr. T. Crampton very early took a long step in advance of current ideas and methods in the use of soft coal, and the limited adoption of his patent in daily practice is probably due to the little time so busy and successful an engineer could devote to its advocacy; and also to the fact that the working plant required was somewhat elaborate for small horse-powers, and for large establishments, a further step in advance of his practice was soon afterwards taken by Dr. W. Siemens, who converted coal waste, shales of low quality, and other low priced fuels at once into the gaseous form (carbonic oxide), using this gas—which, although not luminous, possesses large calorific power—as fuel for all industrial purposes. The gaseous form of fuel infinitely increases the possible surface and closeness of mechanical contact between fuel and oxygen before combustion, and readily permits the absolute control of the amount of air supplied.

2nd. MALLETT.—Before more fully describing the recent "Siemens" developments, E. J. Mallett's theories and arguments deserve consideration, although comparative figures from practice are not attainable. Making a clear distinction between combustion of carbon (coke) and the formation of flame, he emphasizes the statement that heat is increased, while smoke and light are lessened, by the burning of any flame in an atmosphere at high mountain elevations, or—what amounts to the same thing—with air at less than normal barometric pressure, and asserts that one of the first requirements for perfect combustion is air at low tension; and to readily attain it at ordinary levels, he dispenses with chimney draught, and substitutes fan-suction at the forward end of the furnace or boiler.

Through tubes that form the furnace grate-bars air, partially warmed in its passage, is drawn by the fan-suction into the combustion chamber, in front of a perforated fire-brick wall (or septum) dividing the combustion chamber from the furnace proper; and large amounts of this warmed air are permitted to enter the chamber after each supply of fresh coal, the volatile matter of which at once undergoes rapid distillation on touching the incandescent coke, with the natural effect of cooling down the fire; but to avoid any additional cooling, and consequent formation of smoke, the supply of air usually flowing into the ash-pit, and thence through the fire-grate, is completely cut off; one lever, controlling the upper and lower damper slides, being so connected, that when a liberal supply of air is passing through the hollow grate-bars and diffusing itself forward of the septum wall, the ash-pit is sealed air-tight; the amounts of air delivered being steadily varied, and eventually reversed in relative quantity, as the lever is drawn over, fully opening the ash-pit damper when there is nothing but coke to burn on the grate.

Analogy, drawn from the Bunsen burner, is used as an argument for dividing and distributing the incoming warm air at numerous points; the openings in the septum wall being so arranged as to give at once the most complete intermixture of the liberated hydrogen and hydrocarbon gases, with the warmed air entering through the numerous hollow grate-bars.

The theory of his feedwater heater, or "Athermous Superheater"—although only indirectly connected with combustion—is of interest, and is based on Tyndal's statement, that dry air freely permits through itself the passage of radiant heat without loss of heat by absorption; whereas saturated or even moist air is a rapid and effective absorbent of radiant heat. Conversely, the radiating power of all gases—and this heat radiation is what we desire to utilize commercially—is increased proportionately to its absorbent power; therefore, to take all possible calorific value from the escaping gases, they are after leaving the boiler flues, moistened down to dew point by hot water-spray through a rose-jet, and also by admixture with the exhaust steam from the fan-engine, and then passed over a sufficient number of coils of metal pipe (heat absorbents) through which the feed water is moving on its way to the boiler.

It is claimed that the products of combustion, when thus saturated, part with their heat so completely that a portion of the feed water is converted into steam.

Mr. Mallett claims that he has arranged his system to meet locomotive requirements, the exhaust steam from the main cylinders, instead of educing blast, being used partially to warm fresh air for coach ventilation, and partially condensed in the tender tank, thus warming the feed water. We regret that experimental results cannot be given showing the practical value of this novel attempt at economical and smokeless combustion of soft coal.

3rd. Howden.—His method, as illustrated in a boiler of the single return-flue type, has the back head-sheet boxed up, forming a reservoir, through which all the air required is forced (under compression) by a fan, and it is warmed in its course past the head-sheet and around the smoke-flues that traverse this chamber from smoke-box to chimney. From this chamber the air exit is by passages leading both to the upper part of the furnace and to the ash-pit, with their actual amount of opening controlled and constantly varied by the stoker, through the movement of levers on the outside, thus giving him the independent control of the amount of compressed air supplied, either above the solid fuel or below it; air-tight doors preventing any escape from the inside except by way of the chimney, which need be but of short length.

Opening the furnace door to admit fresh coal automatically closes all these plenum air passages, thus preventing the excessive inflow of cold air, so destructive to seams and joints, when (as in those otherwise most successful crafts, the British torpedo boats,) there is air pressure in the closed boiler room. It may be well here to remark that all attempts at forced combustion are with the object of burning a greater number of pounds of fuel per square foot of grate; thus economizing space and developing the greatest horse-power from the smallest expenditure of capital in purchase of boiler.

Large consumptions per square foot of grate have not, until recently, proved economical in coal per horse-power developed, due principally to the choked air supply, natural furnace draught being unable to draw in sufficient to burn all the carbonic oxide evolved from the deep mass of hot carbon without the temperature in the chimney being so high as to waste the heat by throwing it out into the atmosphere unabsorbed, or a chimney of excessive elevation and cost was used.

Mr. Howden recently, before the Institute of Naval Architects, claimed to have secured per pound of Scotch coal an evaporation of 10 pounds of water (from 212°), consuming 30 pounds of coal per square foot of grate per hour. This, using a compound cylindered engine, developing a horse-power per 20 pounds of steam, gives 15 horse-power per square foot of grate, with but a fraction over two pounds of coal per one horse-power—a good showing.

4th. SIEMENS.—His system is by the partial combustion of cheap coal in detached converters (with insufficient supply of oxygen) to change this solid fuel into gaseous fuel (C_2O); conveying it thence by pipes to the different furnaces and boilers throughout the workshops or town, where combustion is completed, and it is burnt from oxide to acid (CO) by the addition of one more part of oxygen. The air ducts in his regenerative furnace, being so arranged that the heat otherwise wasted is utilized in raising the temperature of the inflowing air, before it reaches the mixing chamber, almost up to igniting point, and the absence of open grate, and control over the comparatively small amount of air required, results in the highest working temperature yet attained. When solid fuel is used and intense temperatures are required, comparatively small grates are necessary; therefore, in the earlier Siemens practice, it was inferred that in burning gaseous fuel (C_2O) a small combining chamber (with close walls and low roof) was also necessary, this having the natural result of bringing the flame into close contact with the walls, as well as with the material to be heated.

Later experiments have proved the complete fallacy of this idea, Mr. F. Siemens having discovered that by simple radiation from flame, and convection of the completely burnt products of combustion, the most intense temperatures can be transferred in all manufacturing processes, with surprising economy in fuel, with increased length of life in furnace, and in metallurgy and glass-making, &c., with a greater percentage of finished product per unit of crude material used.

This commercial success is obtained by making the combustion chamber or furnace so very large that the flame cannot touch either walls or material to be heated, and thus its activity is not quenched when but partial combustion has taken place, as is the case if it touches any solid substance, whatever be the temperature of that substance.

This is a complete reversal of the old-fashioned and still prevalent idea that, for instance, a boiler should be set as close to the fire as possible, so that the flame may inpinge directly on the evaporating surface, or on the material to be heated.

Mr. Siemens last year, at the Chester meeting of the Iron and Steel Institute, said: "The interruption of the process of combustion by "the interposition of solid bodies always tends to injure, or even "destroy them.

"But, besides the circumstance that solid bodies are injured by "flame, it can be easily shown that when flame is brought into con- "tact with any solid body, it is more or less quenched according to "the substance, size, and temperature of the body. A very simple "experiment in proof of this, and one which is familiar to most "people, is the following:—Take any ordinary illuminating gas "flame, such, for instance, as a bat's wing, and place a glass rod or "tube into the middle of it; the flame will immediately burn dull, "and a large quantity of lamp-black will be deposited on the piece "of glass. This action is most marked when the rod is cold, but "takes place, though in a less degree, at any temperature, for the "reason that the material to be heated is necessarily always at a "lower temperature than the flame, also owing to the disturbance "in the combustion caused by contact of the solid substance with "the flame."

His experiments "establish the following important fact, namely, "that a good flame, or, in other words, perfect combustion, can only "take place in an open space, or in one of sufficiently large size to "allow the gases to burn out of contact with solid material."

In conclusion, the author would note that these four methods, considered together, show that the problem of bituminous coal combustion is receiving its modern solution by the admission of air forward or above the grate ; under control as to the amount delivered, to suit the needs of such an ever varying fuel as crude soft coal proves to be.

Thus, instead of combustion being confined to the fire-grate, or being a factor of grate surface, or style or proportion of grate (as implied in many patented and peddled nostrums for so-called "smoke-burning") a most effective use can be made of solid mineral fuel, as shown by Mr. Crampton, without *any* grate, or, as established by Mr. Siemens, if gaseous fuel is used, with the only grate required miles away from the combustion chamber.

It is now clearly recognized that coal is not a simple substance to be treated in a simple manner, and capable of but one or two combinations with oxygen, but that the air needed for its complete combustion is to be supplied in the ever varying proportions respectively demanded when hydrogen, the various hydro-carbons, carbonic oxide, and fixed carbon (coke) are being burnt; and that the air must be supplied at the different localities in the furnace or combustion chamber, where these products of the raw fuel are most effectively oxidized, and, other things being equal, the warmer the air supplied and the less in quantity it exceeds the minimum amount required, and the more freedom given for the flame to burn out free of all contact with solids, the higher will be the resultant industrial economy, and the less shall we be troubled with the smoke nuisance.

A brief discussion followed, in which Mr. Alan Macdougall made some remarks on the value of such knowledge from a sanitary point of view, as the incomplete combustion of coal as shown by the cloud of smoke that hangs over some of our towns, did not add to the public health.

The President, after expressing his interest in the subject, asked on what the statement was based that hydrogen and carbon combined as in coal seemed to have a higher calorific power than when uncombined.

In reply to Mr. Macdougall, Mr. Barnett pointed out how much easier it was to avoid smoke and soot from stationary boilers as used in towns than it was to get rid of the same nuisances in railway locomotive practice, the rapid combustion and large consumption per square foot of grate surface, amounting in some cases to as high as 80 or 90 lbs. per hour, made perfect combustion in the small fire-box of a locomotive a difficult end to obtain. However, the locomotive fireboxes of Messrs. Wootten & Strong, with their, comparatively speaking, enormous grate surfaces and slow combustion, were a step in the right direction, time being necessary for perfect combination in combustion.

In reply to Dr. Ellis, he said the full details and results of Messrs. Kestner & Meunier's extended experiments that seem to contradict Dulong's formula, were to be found in the "Bulletin de la Société Industrielle de Mulhouse," 1868, 1869, 1871; in "The Annales de Chimie," 4th series XXX., 5th series II., XXI., 6th series II.; and in the "Comptes Rendus de l' Académie," 2me Série, 1869, and they were understood to have been carried out in the direct production of steam in a boiler and not in minute laboratory experiments.

M. L. Gruner had endeavoured to explain away the apparent anomaly between formula and experiment, and a partial translation and condensation of his paper from the French had been reproduced by R. P. Rothwell in the "Engineering and Mining Journal" of 1874.

Mr. M. L. Rouse then read a paper on "The Analogy between Consonants and Musical Instruments," of which the following is an abstract:

Taking pains to distinguish between a truly aspirated consonant and a consonant with *h* prefixed to it (the suffixing of *h* producing no blending at all), he showed that aspiration always consisted in bringing the lower organ of speech (tongue or lower lip) into the right position for uttering the simple sound, and then flattening it a little and breathing over it. And by this definition he added two aspirated consonants to the already received category—namely, the Continental rolling *r* and the Irish *l*, which is heard when a native Irishman utters the words *milk*, *help*, *hill*, &c., and is also prevalent among the French. Eliminating, then, all compound sounds, he arrived at the following table of consonants, which, save in the above respects, differs little from Morris's :—

	FLAT.		SHARP.		NASAL.
	UNASPIRATED.	ASPIRATED.	UNASPIRATED.	ASPIRATED.	
MUTES:					
LABIALS	b	v	p	f	m
DENTALS	d	'd	t	't	n
BACK-PALATALS OR GUTTURALS ..	g	'g	k	'k	n͡g
PHARYNGEAL	h				
SPIRANTS:					
LIQUIDS	r	'r	l	'l	
SIBILANTS	z	'z	s	's	

NOTE.—'d = *th* in *thine*; 't = *th* in *thin*; 'g = *g* in *lough* (Ir.); 'k = *ch* in *ich* (Ger.);[*] 'r = Continental rolling *r*; 'l = Irish *l* heard in *milk*, *help*, &c.; 'z = *z* in *azure*; 's = *s* in *shine*; n͡g = *ng* in *ring*.

He then compared with this the natural classification of musical instruments, which he claimed to be as follows :

	FULL-TONED.	SLENDER-TONED.	REED.
BEATEN:			
WOOD	WOOD UPON WOOD, *Xylophone.*	METAL UPON WOOD, *Saw.*	WOODEN, *Clarionet, &c.*
METAL	WOOD UPON METAL, *Harmonicon.*	METAL UPON METAL, *Bells, Musical Box, &c.*	METAL, *Harmonium, &c.*
STRING	HAND UPON STRING, *Harp, Guitar, &c.*	STRING UPON STRING, *Violin, &c.*	STRING, *Æolian Harp.*
MEMBRANE	*Drum.*		
BLOWN:			
WOOD	BLOWN FROM THE SIDE, *Flute, &c.*	BLOWN FROM THE TOP, *Flageolet.*	
METAL	BLOWN FROM THE SIDE, *Organ.*	BLOWN FROM THE TOP, *Trumpet, &c.*	

NOTE.—The aspiration of consonants seems to correspond in its prolonging effect to the use of the pedal or swell.

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[*] In my lecture I classed the sound of *ch* in the Scotch *loch* with its sound in the German *ich*. But the criticism of Mr. VanderSmissen led me to see that in the former word it has the same pronunciation as the *gh* in *lough*, and, furthermore, that after the four deeper vowels, long and short, the flatter guttural is always given, while after the four higher ones the sharper guttural (cf.: *buch G.*, *loch G.*, *loch S.*, *dach G.*, *urgh ! E.*, *pech G.*, *bücher G.*, *ich G.*).

A complete set of organ reed pipes would be a more typical metal reed instrument than a harmonium, since it would contain the beating reed, which strikes the sides of the apertures, whereas the harmonium contains the free reed which vibrates clear of the sides.

The best proof that an aspirated consonant does not consist of *h* prefixed to a plain one, is the fact that *h* may be actually uttered directly before an aspirated consonant. Thus, to impose silence, we may either exclaim gently *sh!* or more vigorously *hsh!* and in the game of draughts, or checkers, we may blow upon a removed piece with *f!* or with *hf!* our action, indeed, being called *huffing*.

TENTH MEETING.

The Tenth Meeting was held on 6th February, 1886, the President in the chair.

The following list of Donations and Exchanges was read:

1. The Canadian Practitioner, February, 1886.
2. The Canadian Entomologist, Dec., 1885.
3. The Electrical Review, Jan. 30 and Feb. 6, '86.
4. American Journal of Science, February, '86.
5. Johns Hopkins University Circular, Jan. '86.
6. Science, Vol. VII., No. 156.
7. Proceedings of the American Antiquarian Society, Vol. IV., Part I., N.S.
8. Mineral Resources of the United States, 1883–84.
9. Transactions of the New York Academy of Sciences, Vol. V., No. 3, Dec. '85.
10. Journal of the Franklin Institute, Feb. '86.
11. Electrician and Electrical Engineer, Feb. '86.
12. The American Catholic Quarterly Review, Jan. '86.
13. Sandberg on Rail-Joints and Steel Rails.
14. Proceedings of the Physical Society of London, Vol. VII., Part III., Jan. 1886.
15. Transactions and Proceedings of the Botanical Society of Edinburgh, Vol. XV., Part II.
16. Palestine Exploration Fund—Quarterly Statement, Jan. '86.
17. Illustrated Journal of Patented Inventions, No. 57, Jan. 22, 1886.
18. Trübner's American, European and Oriental Literary Record, Nos. 217, 218.
19. Imperial Federation, Vol. I., No. 1, Jan. 1, '86.

20. Cosmos, 18 Janvier, 1886.
21. Compte Rendu des Séances de la Commission Centrale de la Société de Géographie, No. 1, '86.
22. Mémoires et Compte Rendu des Travaux de la Société des Ingénieurs Civils, Août, 1885.
23. Bulletin de la Société Royale de Botanique de Belgique, Tome 24me Fascicule 2me, 1885.
24. Cronica Cientifica—Barcelona. Año IX., Num. 194.
25. Monatsblätter des Wissenschaftlichen Club in Wien, VII. Jahrgang, Nr. 4.
26. Wochenschrift des œsterreichischen Ingenieurs und Architekten-Vereines XI. Jahrgang Nr. 3.
27. Journal des Sociétés Scientifiques, 6 et 20 Janvier, 1886.
28. Jahrbücher der K. K. Central-Anstalt für Meteorologie und Erdmagnetismus 1884, N. F. XXI. Band, Wien.
29. Atti del Museo Civico di Storia Naturale di Trieste, Vol. VII., '84.

Total 31.

Mr. R. F. Stupart read the following paper on "The Eskimo of Stupart Bay:"

My paper this evening treats more especially of the Eskimo and their mode of life as observed by myself during a twelve months residence among them on the shores of Hudson's Straits, but, in addition, I have thought it advisable to give a brief outline of a portion of the cruise of the steamship *Neptune* in the summer of 1884, and also of a boat voyage made by myself and three men from Prince of Wales' Sound to Fort Chimo during the latter part of last August. The Canadian Hudson's Bay Expedition of 1884 and 1885 was, as you are all aware, sent out to report on the feasibility of establishing a commercial route to Europe from the Canadian North-West *via* Hudson's Straits. Six observing stations were established at different points along the shores of the Straits, the duties of observers being to watch the movements of the ice and tidal currents and to take meteorological observations. In addition to this, the ordinary work, I made a series of magnetic observations; I had two observatories, one in which I made absolute determinations of the declination, force, &c., while in the other were placed the differential instruments, which were read every four hours, and during days of much disturbance every five minutes. The discussion of results here obtained is, of course, foreign to my subject to-night.

The date of the earliest mention of the Eskimo is about 990 A.D., when some Icelanders exploring Greenland came across men with skin-boats. The Eskimo have therefore inhabited the Western

Continent for at least 1000 years. It has generally been supposed that they originally came across Behring Straits from Asia, but the race is one of which very little is known. Although scanty in numbers, they wander over a larger extent of territory than do any other people. They alone among savage races occupy both the old and the new world; they inhabit the shores of the Arctic Sea from Siberia to Greenland and Labrador, and throughout this vast extent of country the language, appearance and occupation of the natives are very similar. Of course their habits have at some points been modified by contact with the whites; it could scarcely be expected that the untutored savages who inhabit the shores of Hudson's Straits and the Arctic Coast line should entirely resemble the more favored portions of their race, who have been, to a certain extent, educated by the Moravian brethren on the Labrador coast or by the Danish missionaries in Greenland.

In appearance the Eskimo somewhat resemble the Chinese and Tartars; they are generally small in stature, the average height of a man being about 5 ft. 1 in. or 2 in., but I have seen a few who were as much as 5 ft. 9 in. or 10 in. Their features are broad and flat, the hair is very coarse, invariably jet-black and quite straight; few of them have much hair on the face, but there are exceptions. In color they are about as dark as the Indians, but the layer of dirt and oil, which as a rule covers both face and body, makes it rather hard to determine the exact shade.

Sir John Lubbock, in a treatise on the Eskimo, says that the language is akin to the North American Indian in structure. This may be the case, but the two languages are certainly different in sound. The opportunities afforded me of learning the language were very limited, as I and my men were dumped down at the post among the natives but a very short time after the interpreter was taken aboard the ship at Nachvach, on the north coast of Labrador. During the short time I spent with him I obtained the Eskimo words corresponding to certain English sentences, which I thought might come in useful; for instance, "What is the name of this?"—"shoo-now-nah," "Bring me some fox-skins," — "Terry-gyn-yer-mik-p-u-mo-ouma." By means of the former I was enabled to obtain from the natives themselves the names of a large number of things of which I made a vocabulary, and by first guessing at and afterwards asking the meaning of the sentences in most common use among them I was able, after a few months, to understand them and also to make myself understood.

The costume of an Eskimo usually consists of two suits, the inner always of deer-skin, with the hair next the body, and outer deer-skin in winter, and seal-skin in summer, with the hair out. The men and women dress much alike—a coat, trousers and seal-skin boots; the coat, or "Koalatuck," as they call it, is put on over the head; that of a man has a hood attached large enough to cover the head, if necessary, whilst the hood attached to the woman's coat does double duty, being used both as a covering for the head and as a place in which to carry the babies. The woman's coat has also a long narrow tail behind which ordinarily just touches the ground but is sometimes looped up.

Among the Eskimo, ornaments are not numerous, neither is there a great variety; the outer coat of both men and women occasionally has a border of white bear-skin, but is more often devoid of ornamentation. Sometimes the inner coat, which in the igloos and in warm dry weather is often alone worn, is trimmed with walrus teeth, which are sewn on, an inch or so apart, round the lower edge, or it is trimmed with a fringe made of deer-skin. Glass beads can be obtained from the Hudson's Bay Company at Ungava, and some of the women belonging to the richer Eskimo families are the happy possessors of necklaces and of strings of colored beads which are sewn on to the front part of the inner coat; other favorite ornaments are common metal spoons, with the handles cut off; these sometimes, to the number of seven or eight, are attached vertically at equal distances to the front part of the coat. Women are often, but not invariably, tattooed; a few lines are made on chin and forehead, the former diverging from the lower lip, the latter from the upper part of the nose.

The *Neptune* sailed from Halifax on July the 22nd, 1884. On her way north she touched at the Moravian Mission Station, Nain, on the coast of Labrador. Before the anchor was down we were boarded by the missionaries and many Eskimo. The former were, I fancy, somewhat disappointed at finding that we were not the mail steamer, as they were expecting news from home, but the natives were evidently much pleased at our arrival, and examined the steamer from stem to stern with delighted curiosity. The Eskimo population of Nain is about 200; they live in about 45 log and mud huts, which are clustered together on a small plateau near the mission buildings. Most of the people are small in stature, and my impression is they were quite as dirty as the completely uncivilized people I afterwards met to the northward, but it may be that a month later I was more accustomed to seeing dirty people. Our ship remained at Nain for a whole day, and as I spent the greater part of the time ashore, I was able to fully inspect the station and also to form some idea of the work performed by these missionary traders of the North. The natives living here are like all other residents of the Labrador coast. generally employed in trapping, hunting and fishing; all the furs, skins and oil they obtain they bring to the missionaries, who, in return, supply them with ammunition, tobacco, and a limited quantity of flour and pork. Attached to the station is a school-house, and be it said to the credit of the missionaries, almost all the natives of sufficient age can read and write in their own language. There is also a chapel, in which service is held every evening. The choir is composed of the families of the missionaries and of the natives, and is assisted by an old-fashioned organ and by eight or ten violins played by music-loving Eskimos. Although the sincerity of the evangelizing efforts of these Moravians has often been called in question, I think that any one witnessing one of the services in the quaint old chapel at Nain will confess that a good work is being done. The gardens are a most pleasing feature of the place; potatoes, turnips, lettuce, spinach and onions are grown, but require an immense amount of attention, as they all occasionally require to be artificially protected from frost.

On August 1st we touched at the Hudson Bay Station, Nachvach, 90 miles south of Cape Chudleigh. Here we obtained an interpreter, who subsequently proved of great value, when we got among the natives on the shores of the Straits. August 5th—We anchored in a little harbour just inside Cape Chudleigh, the Commander of the expedition having determined to here establish an observing station. Codfish were so abundant at this place that we actually, in a very short time, were tired hauling them into the boat. There was an Eskimo family living at a distance of 8 or 10 miles from where the ship was anchored, but I did not see them. Those of the expedition who did pay them a visit describe the tent and its occupants as being villainously dirty, and all seem to have considered it advisable not to venture too close. We left the harbour, called Port Burwell after

Mr. Burwell, the officer in charge, on August 8th, and steamed northward across the Straits. A little snow fell that evening. August 9th.—It was blowing too hard to effect a landing on Resolution Island, so in the afternoon we stood off shore hoping for a fair day on the morrow. The fates were, however, against us. Sunday, Aug. 10th.—At early morning it was blowing a gale from the eastward, and before noon the wind chopped round and blew still harder from the west, and during the remainder of the day we were lying too and making no headway. On Aug. 11th we passed through many miles of loose ice, but none of it was of sufficient size to seriously impede our progress. Late in the afternoon we entered a small inlet in the large Upper Savage Island, where it was decided to establish another station, the officer in charge being Mr. W. A. Ashe, of Quebec. We had scarcely entered the inlet when an Eskimo put out to us in a kyak. He told us, by means of the interpreter, that there were several families camping near by; they had shot two reindeer that day, and their headquarters were near an American trading station, which we knew existed some 30 miles to the westward. On the following day we were visited by about a dozen of the natives, who walked off to us on the ice which had closed in round us with the flood-tide. Some few of them could speak a little English, and possessed a few articles of European clothing. However, from what I saw of them, I should judge that, morally speaking, up to that time they had not benefited by their contact with the whites. Aug. 16th.—Early in the afternoon we left Ashe Inlet in a snowstorm, and steamed slowly south. About 6 p.m. we passed an enormous berg, probably from Fox Channel; it shewed about 50 feet out of water and was fully a quarter of a mile in length. At dark the engines were stopped, and we lay to until daylight, when we again started. At about 10 o'clock we entered a field of loose ice which extended almost to the coast; many walrus were seen playing about among the blocks of ice. Shortly before 1 o'clock we neared a long rocky point, and Lieut. Gordon proposed building my observatory on it if he could find anchorage in the bay beyond. Viewed from the ship the site certainly did not look inviting, but before long we were anchored in a small bay, open only to the S.E., from the end of which a valley, which at places looked green, extended far back into the country, bounded on either side by high rocky hills. After dinner I went ashore with my men to have a look around. I found a stream of good water and a first-rate site for a house, while, from the top of the rocks, a good view of the Straits could be obtained. We also found traces of reindeer, foxes and ptarmigan. On returning to my boat I found Lieut. Gordon, the officers of the ship and most of the men were ashore. Before long we saw a group of Eskimos, principally women, accompanied by dogs, approaching us over the brow of a hill; they were shouting "Chimo, Chimo," and were evidently very anxious to trade with us. They looked very good-natured and very dirty, and called "tobaccomik, tobaccomik." On obtaining some black tobacco and matches they howled with delight and hugged it. In a short time our interpreter, Lane, who had been down the coast in his kyak, put in an appearance and explained to the people that we were going to build a house; when they heard this they threw up their hands and fairly shrieked with delight.

During the stay of the *Neptune* at my station, which was from Sunday till Friday, the Eskimos were continually loitering about. There were at this time four families living in tents about two miles distant to the westward and several more families still further away. Sunrise each morning brought the majority of them to the place where our men were building the house; they generally had some small articles for trade, such as sealskin mittens and boots, for which they almost invariably wanted tobacco. Scarcely ever did they offer to assist in carrying up the material for the house or the coal, and if by chance any of them did lend a hand, they expected to be well paid with tobacco and matches. The sealskin tents (called by them "toopicks,") in which these people live from about the middle of May to the beginning of November, vary from about twelve to twenty feet in length; they are spread on a ridge and are further supported by several upright and slanting poles; the latter have, as a rule, been obtained from a long distance to the southward. I do not think any wood large enough for tent-poles can be obtained within 250 miles of Prince of Wales' Sound. The skins of which the tents are formed are those of the large harp-seal; the hair is scraped off, and they are stretched out in the sun by means of pegs driven into the ground. The beds are ordinarily laid in the inner end of the tent, but sometimes when there are many occupants also extend round the sides. A layer of dry moss is first spread on the ground and over this are spread deerskins and sealskins, which have been softened by working them with the hands and teeth. The Eskimo of Hudson Straits seem to have no method of tanning skins.

The ship left us Aug. 22nd, and we all settled down to work getting things into shape, I and my assistant, Mr. Bennett, adjusting the instruments, the men making the house as snug and comfortable as circumstances would admit of. During the latter part of August and early part of September the weather was generally unsettled, with a preponderance of easterly winds and a good deal of light snow. Aug. 23rd and 25th were the only really warm pleasant days we had; on these days there was bright sunshine, and the temperature rose to between 45° and 50°, but clouds of mosquitoes ("Kitorraya," the natives call them) rather interfered with the enjoyment of the fair weather. Until after the 6th of Sept. there was a good deal of drift ice off the coast, and whenever the wind was from the S. E. our little bay was quite blocked up with it. Almost every day we were visited by a large number of women and children, who continued bringing all sorts of things to trade for tobacco, but we saw but little of the men, who were generally out hunting in their kyaks.

On Sept. 23rd the *Neptune* returned from her trip across Hudson Bay. She remained a day and a half, and during the time she lay at anchor every man, woman and child who could possibly get there was either loitering about near the house or hovering round the ship in kyaks, calling out for tobacco and matches. From the time the ship left us, on the 24th Sept., until about the middle of November, we were not much troubled by the natives. They were still living in their toopicks, and I fancy that almost all of them having obtained a fair amount of tobacco from the men on board the ship were contented to leave us in peace for a time. On Oct. 24th the temperature fell to zero, and the Bay and Straits as far as I could see were frozen over.

Without seals and deer, the Eskimo could not exist. Their food is seal's meat and venison, both generally eaten raw but occasionally cooked; their dress is of the skins of seals and deer; their habitation is for at least a portion of the year formed of sealskin, and their boats are of the same material.

The kyak is a most ingenious contrivance, and, I believe, peculiar to the Eskimo. A framework of small wood is formed, from 15 to 20 feet long, about 18 inches broad in the middle, tapering to both ends, and not over a foot in depth; the whole is covered with sealskin with the exception of a space in the centre just large enough for a man to sit in. As to stability it would compare favourably with a small Indian birch-bark canoe. It is propelled by a double-bladed paddle, in fact in much the same manner as a Rob Roy canoe. I have often read that the Eskimo can, if capsized, right his kyak again ; I have never seen it done, nor have I ever come across anyone who has seen it. Perhaps this skilful feat has been forgotten. I certainly think it would require an immense amount of practice, and I can scarcely imagine anyone, unless by accident, taking a bath in water of temperature near the freezing point. The "umiak," or woman's boat, is much larger than the kyak, and has a flat bottom. It is made of slender sticks fastened together with whalebone and covered over with seal-skins. It will sometimes hold as many as twenty or thirty people, is propelled by rudely made oars, and is steered with a rudder.

During November it became evident, from the number of new faces we saw, that the natives from other parts of the coast were congregating in our neighborhood. About the middle of the month my two men paid a visit to the encampment, and found that instead of five scattered tents there were about ten snow igloos, all close together. As each igloo is generally inhabited by from ten to twelve people, this meant a population of over a hundred. In building their snow igloos the Eskimos take advantage of the fact that, owing to the intense cold, with no thaws and continual drifting, the snow becomes quite hard and compact and can be cut into blocks and slabs. The igloos are generally built on the shore, not far from high water mark ; a tolerably level spot where the snow is, say, about a foot and a half deep, is chosen. The builder first marks out a circle of about twelve feet in diameter ; he then goes to work with a long knife, called by the Hudson Bay Co. a snow-knife, and hollows out the circle, cutting the snow into blocks about a foot square or of a rectangular shape of say 1 × 1·5 feet, and from 4 to 6 inches thick. With the blocks thus obtained, together with others cut near by, a circular wall is built by putting one block on top of another. As the construction proceeds the wall is made to gradually curve inward until finally an almost perfect dome is formed of about 12 feet diameter and 8 feet high in the centre. The door, a hole about 2 ft. broad and 3 in height, always faces the southward. The inner half of the igloo is built up with blocks of snow to the height of about 2½ feet, and on the raised part is spread a lot of dry moss and sea-weed to form the beds. Two smaller igloos are built to the south of that in which the people live and do double duty as porches and kennels for the dogs; there is also generally a small igloo built with an opening into the porch, which is used as a storehouse for any surplus supply of meat they happen to have. The number of people inhabiting an igloo varies from about 8 to 14; it ordinarily comprises an elderly man—the head of the family—and his wife and one or two married sons with their wives and children. It seemed to me that the boys far exceeded the girls in numbers, but of this I cannot be certain.

The worldly possessions owned in common by the members of a family are not numerous. They ordinarily consist of a tent for summer use, a few small tin-pails, used for melting ice during the winter, one or more lamps, according to the number of women in the tent each grown-up woman having a lamp, a few stone dishes and pots, and some skins used as bed-covering. Each individual, as a rule, has two suits of clothing; a man generally but not invariably owns a kyak, a muzzle-loading gun, obtained in trade with the Hudson Bay Co., together with caps, powder and bullets, knives and a spear, a lance-head with a long coil of walrus-line and a bladder used as a float for the harpoon-line, when a seal or walrus is struck. A woman has a semi-circular knife used for scraping skins, a few needles, some sinew for thread, a bone thimble, and, if lucky, some ornaments in the shape of beads. Belonging to each family is generally a team of from five to ten dogs and two sleighs, called by them commatiks, one of which, about 8 feet long, is used with all the dogs when moving their quarters, and the other, just large enough for one man, is drawn by two dogs and is used for hunting on the ice. The dogs are generally a trifle smaller in size than our English setter and in color vary almost from black to a dirty yellow; they have sharp pointed snouts and bushy tails which curl over the back; they are vicious and savage but, I think, great cowards. The Eskimo would be lost without dogs, all travelling is done by means of them, and they are good scavengers. An igloo and its vicinity is always filthily dirty, but were it not for the dogs it would be ten times worse.

The men spend the greater part of their time hunting. In summer they sleep but little; in winter they often hunt during the short period of daylight, but they sleep a great deal. On the women devolve the cares of the household, they make all the clothes and boots, melt ice over their lamps and do whatever little cooking there is to be done. They all go in for some amusements, a sort of foot-ball is played on the ice; wrestling is a favourite amusement with the men. The children romp and play about, in fact have games very similar to those played by white children. It is quite marvellous the amount of cold these people can endure, they are inured to it from infancy. Many and many a time I have known women spend a whole day loitering about near the house with the temperature 10 and 20 below zero, their necks uncovered, nothing on their heads, and stark naked babies sprawling half out of the mother's hoods; how the children stand it I cannot tell, but that the poor little youngsters do feel the cold I am convinced, as they often cry most piteously. Both men and women sometimes are cold; they would often stand at my door and beg for admission saying they were cold. E-ke is their word for cold.

The marriage laws are very simple, in fact as far as I could learn the woman, without form or ceremony, takes up her abode in the igloo of her intended. Neither are the funeral obsequies elaborate, the body being carried to a distance from the tents and covered with stones. On top of the grave are placed the man's hunting implements together with a cup and a knife. This would seem to imply that they have some idea of a future state; but what their religion, if any, really is, I was unable either to discover from the natives or to learn from the Hudson's Bay Company, men who have lived among them for years.

Two days after Christmas I paid a visit to the Eskimo igloos; I and one of my men started at seven o'clock in the morning, long before daylight, and walked across the ice, following the path beaten by the natives in their daily visits to the house; the temperature was 23° below zero, and it was blowing fresh and drifting in our faces. After having walked about two miles we met two Eskimos; one of them, an old man named Pugweek, put his hand over my cheek, giving me to understand that it was freezing. In about a quarter of an hour we arrived at the snow houses, all of which were quite new, and removed about half a mile from those the natives occupied during the early part of the month. Let me describe some of the people. I first visited Pugweek's residence; stooping down and entering almost on hands and knees I found myself in a passage about twelve feet long, dogs were lying and running about in all directions and until quieted by their master seemed rather disposed to resent my intrusion. Having passed through the passage, I crawled through another hole and found myself in the dwelling of and among an Eskimo family. The stench was frightful. Cries of "Chimo," intermingled with those of "tobaccomik," greeted my entrance. On the right of the raised portion of the house squatted Pugweek's wife. She might have had on more clothing, but I presume she had not yet made her morning toilet. She was very ugly, astonishingly dirty, and had no teeth. I gave her half a plug of tobacco, for which she said Ne-cook-a-mik, and immediately asked for matches—"matchemik." Pugweek's sister, Polin-a-chuor, was squatting close by; she too set up a howl for tobacco and I gave her a piece. She proved the most inveterate beggar and greatest nuisance among the women. Children of all sizes were lying on the bed covered up with dirty skins, they too asked for tobacco, but did not get any.

I afterwards discovered in a very practical way that Pugweek was a great thief. I also discovered that about 1860 he had taken part in the massacre of a boat's crew. The Hudson's Bay Co.'s ship "Kitty" was wrecked near Cape Wolfstenholme; out of a crew of about seventeen, ten were killed by the Eskimo while endeavoring to land from the wreck, the remainder, escaping down the coast in a boat, were massacred while asleep by the Eskimo of Prince of Wales' Sound. Two others of the murderers besides Pugweek were my near neighbors, Cowjut and Ne-bo-cart. These men are not permitted to visit the Hudson's Bay post at Ungava.

The next igloo I went into was that belonging to Cowk-to-wayo, a quiet old man who had welcomed us when the steamer first arrived; we all then thought that he was a chief among his people, but I subsequently discovered that there is no chief; all members of a family to a limited degree owe obedience to the head of that family, but as far as I could learn no common chief is recognized by different families; the most successful hunters are as a rule the men who are most respected.

Cowk-to-wayo's igloo was very like that of Pugweek. The old man was sitting next to his wife, a very talkative little woman, who evidently thought that the one thing worth living for was smoking, and further that the whites having been sent to Hudson Straits to keep the Innuit (Eskimo) supplied with tobacco, it was my bounden duty to see that she was never in want of it. A son, Kish-a-watch-Kia, and his wife Poon-elly and several young children, besides two fairly good-looking daughters, aged 14 or 16, were living with the old man. I gave each a pipeful of tobacco. Poon-elly's baby, which was sprawling over its mother's shoulder, began to cry, and, I suppose by way of a treat, the mother took the short clay pipe from her own mouth and placed it in her baby's. I thought the poor little thing would have choked, but have no doubt that being now a year older, it can duly appreciate a whiff of tobacco smoke.

I visited all the igloos in turn, those of Cowjut, Padliat, Neecook, Owbrook, Ne-bo-cart, Eat-wor-buckeye, Atchick, and several others; last of all I paid a visit to the igloo of U-a-luck, a man whom I always called and considered to be my special friend. U-a-luck is a mighty hunter, very good looking and well built; height 5 feet, 7½ inches; very broad in the chest and a perfect Hercules as regards strength. From the very first he evinced a desire to imitate the whites (Cublunac) in every way possible. He tried to master English and learned many words. I have no doubt but that when he next visits Fort Chimo he will say, please—give—me—a—pipe, and receiving it, will say, thank-ou. U-a-luck's wife, Chi-u-cudelow, is a good-natured looking middle-aged woman; she has two children by her present husband and two by a former. U-a-luck also has a boy by a former wife. His mother and grandmother, together with a second wife and two children, complete the family. I was informed at Ungava that in the winter of 1883 Ualuck, after a visit to the post, when gone about twelve miles on his homeward journey, had found that his grandmother was a great inconvenience and straightway left her out in the snow. The Hudson's Bay Chief was informed of this and sent after Mr. Ualuck, telling him that he must take care of the old lady. In the spring Ualuck was the happy possessor of three shirts, a blue, a grey, and a white, all of different lengths; he generally wore these over all, the longest one underneath, by which means he could show a portion of each; later on he had five shirts and his costume then became ludicrous in the extreme.

Having completed my round of visits, Ualuck hitched up his dogs and drove me home, accompanied by half the population. Arrived at my shanty they all seemed to think that, they having entertained me in their houses, I ought to return the compliment, but I failed to see it in the same light as they.

In the beginning of February the Eskimo again moved their dwellings, Ualuck, Owbrook and Cowjut building close to my house, and the others at points not far distant. About the middle of the month three heavily laden commatiks arrived from about 150 miles, to the westward, the people wishing to trade. I told them to go to Ungava as I had but little powder and tobacco; they refused, however, to go, preferring rather to take small prices, and five temporary igloos were in the course of an hour erected close to the observatory. They remained five days and then departed.

During the winter I occasionally went seal hunting with the natives. We used to start out about nine in the morning with a commatik and five or six men. It was very cold work sitting round a space of open water watching for the seals, the temperature perhaps 25° below zero. With my little Ballard rifle I could often pick off a seal at two or three hundred yards; their guns were only good at a very short range, and they thought my breech-loading rifle a marvellous machine.

As the spring advanced, seals and walrus became scarce, and by the beginning of April many of the people began to show signs of hunger and came begging food from me.

On April 11th the first bird, a bunting, appeared. On April 12th Ualuck, Owbrook and Announshook left to hunt deer; in nine days they returned with three carcases. A few days afterwards they again went away and, in a fortnight's hunting, secured six deer. During May many families were thoroughly famine-stricken. On May 18th a man named Narluck tried to break open the storehouse; failing in that he began rolling away a barrel of pork which had been buried in the snow outside the house. Unfortunately for him one of our regular observations was always taken at 3 a.m., and one of my men on going out discovered what was taking place. We gave the man a thrashing, and I told him that if he tried to break my storehouse-lock again I would shoot him. He gave but little trouble after this, but always looked ripe for mischief. About this time, also, a woman and a boy arrived from the West; they could scarcely crawl along on account of weakness from starvation. They reported that out of seven in their igloo five had died of starvation. Our neighbors happened to have some venison, and the poor wanderers immediately began feasting. Early on the following morning, May 24th, I think it was, a man came to tell me that the boy was pu-une-i-acput, which means "no good." I went over to the igloo and found that the youngster had, after weeks of starvation, eaten enough for two or three boys; he died a few minutes after I arrived. No one seemed to care; another boy took the body on his back, carried it back about a quarter of a mile, put it down and covered it up with stones.

Towards the end of May, at a distance of about two miles from my house, was a snow igloo in which resided an old man and his wife, a son and his wife, a sister and three children. This was the poorest family I ever knew; their worldly possessions consisted of the clothes they wore, a rusty gun—half the barrel had been cut off—only a few charges of powder and shot, two tin-pails, one of which had a hole in it, and a few dirty deer-skins for bedding. They literally had nothing to eat. On May 19th the young man and his wife were out on some rocks on a shoal about three miles out in the Straits, gathering sea-weed, which they often eat when food is scarce; it was low water at the time, and a large block of ice which had been left high and dry by the tide fell on them. The woman was crushed to pieces and the man fearfully bruised. I heard of the accident, and with one of my men and some of the women from the neighborhood, went to the scene of the disaster; the man was moaning piteously, and lying just where he had been thrown down. The tide was rising, and now partially covered the remains of the woman. Some women and children were sitting about wondering, I presume, what ought to be done, but doing nothing. I put the invalid on a sleigh and told some of the girls to pull him to his igloo while I went home for some bandages. Off they started in one direction, I in another, old women accompanying me. When about a quarter of a mile apart I heard the girls calling, and leaving the sleigh on which the man was lying moaning in agony, they came leisurely towards us; it turned out they wanted a pinch of snuff from one of the older women, who had a good supply. This showed me how devoid these people are of all sense of feeling for the misfortunes and suffering of their neighbors.

Sixteen deaths occurred among our neighbors during the spring, and I believe that fully thirteen were caused by starvation.

By the second week in June we had fully 150 natives living within half a mile of the house; they bothered us very much; they insisted on peering in at the windows; it was very annoying having half a dozen dusky faces at each window. We had long since been short of black tobacco—the natives [illegible] had none and were longing for a smoke. We could not leave the house without being assailed with cries for tobacco and questions as to when the steamer would arrive. Polulick is the Eskimo word for steamer. Not being able to obtain tobacco they would beg for the ash out of our pipes ; this they used as snuff, which they consider the next best thing to tobacco for smoking.

The summer wore on. I had expected the steamer about July 10th ; by 15th she might have forced a passage, but the ice did not really move until 18th. July passed and no steamer. By August 4th there was scarcely a piece of ice visible—all seemed clear. I discussed the pros and cons of the question with my assistant and the men, and we unanimously concluded that should relief not arrive by August 21st we would start for Ungava in the boat. It would have been impossible to have remained another winter. Very little provisions and no fuel was left. The winter might set in in September, and as I could not be certain that the Hudson Bay officers at Ungava could keep four men for a whole year, time had to be allowed for a boat voyage to Nain, on the Labrador Coast. We of course inferred that the steamer had come to grief and had perhaps been wrecked.

During my stay on the shore of the Straits I saw many beautiful Auroras, which in nearly all cases were accompanied by great magnetic disturbances. The mean temperature of the year was 12.5 ; that of January was 23° below zero, and of July 43° above ; the lowest temperature registered during January was 35° below zero, and the highest 5° below. The daily range of temperature was at all times small, but more especially in the winter months. The mean temperature for February was, compared with other winter months, very mild, probably unusually mild, the mean temperature being but 3° below zero ; the same month in Toronto the mean temperature was the lowest, but one, that had occurred in forty-five years. Scattered drift ice was plentiful in the Straits until the end of the first week in September, 1884 ; from that until the end of October we saw a few "bergs," but no field ice. On the 24th October the Straits froze over, and few days after that date navigation would have been well nigh impracticable. On the bays and inlets of the sea, ice formed to a thickness of 5½ feet. Until after July 18 last summer we saw scarcely any signs of water in the Straits, but by August 4th the ice had almost all disappeared. We crossed the ice in the bay on July

26th, when it was all honeycombed and in a rotten condition; it went out with the ebb-tide on the morning of July 28th. The most severe storm we experienced occurred on March 21st, the temperature being 20° below zero, and the wind blewing at an average rate of 62 miles per hour, with squalls of over a hundred.

BOAT VOYAGE TO UNGAVA.

Friday, August 21st.—Left station at 4.30 a.m. No wind; rowed all day, course S. by W.; failed to make the land on other side of Bay; lay out all night; calm water.

Saturday, August 22nd.—Started to row again at 8 a.m.; occasionally light air from N. E. and E.; took many hours to recover ground lost by drifting last night; at 6.30 p.m., got into cove where I hope shall be comfortable till morning; not sheltered from E. and N.; heavy surf on rocks.

Sunday, August 23rd.—We lay quiet last night, and this morning, as the wind was unfavourable for rounding far-off point, I contented myself with bringing my boat to an inlet where she would be safe, storm as it may. We are now lying between precipitous cliffs, and within 100 yards of a waterfall of certainly 400 feet, and I think more, in height. At entrance of inlet I estimated the cliffs to be about 2000 feet. The wind keeps easterly and is fresh, threatening rain; weather cold and raw; I intend making a push to-morrow at daybreak.

Monday, August 24th.—Went out this morning but found the wind strong and dead ahead, so put back. I sprained my foot badly this afternoon; any one may imagine my present frame of mind; I am chilled through and through; weather is cold and a drizzling rain is falling; my foot tortures me; four days out and only progressed about 30 miles; quite 250 miles to go.

Tuesday, August 25th.—The easterly wind died out this morning, leaving a heavy sea; started with a light N. W. wind and a terrible jumble of a sea, which made two men sick. About 3 p.m. the wind increased to a fresh breeze, and having come some 15 miles I am now anchored for night in a little cove and under a cliff of nearly 1500 feet; by swell that is rolling in I judge that it is blowing almost a gale outside; the clouds are drifting fast from the N. W.; weather very cold.

Wednesday, August 26th, (noted some days after).—Left anchorage at daylight. When we got clear of cove and bay, found it to be blowing half a gale from N.N.W., and heavy sea running. Kept her full and by until about 7 o'clock in order to round a headland ; got very wet ; sheet in hand ; man bailing all the time ; sometimes had to luff to squalls ; 7 to 8.30 wind on quarter ; now thought we were clear of large bay and course would be about S.S.W. ½ W. down Ungava Bay shore, so kept her away almost dead before it. After about an hour's run it began to dawn upon me that I was running into another long bay as faintly through the mist I could see land abeam on port side, and at times thought I could discern it ahead many miles distant. Thinking it better to be on the safe side I determined to round the Point to E.N.E., and again hauled my wind, laying up for a small island off Point. What a sail that was, 8 miles, close-hauled, a very strong breeze and heavy sea ; the water poured in. I had to keep a man bailing all the time ; everything was soaking wet in no time. Near the Point wind and tide made a tremendous sea, so heavy, indeed, that for some time after passing the Point I was afraid of keeping away for fear of being swamped. We now had the wind almost dead aft, and until about 4 p.m., and made good way. From 4 to about 6.30 it was abeam and blowing a moderate gale ; we fairly hummed along and shipped lots of water. I thanked my stars I had obtained a new mast ; the old one would not have stood with half the wind. Anchored for night in a cove ; landed and tried to dry some of the things. The two men slept ashore, Bennet and I on board ; about 3 a.m. boat grounded, luckily no rocks ; at this place managed to make a fire of moss and cooked some Johnson's fluid beef ; this hot drink went well after the thorough soaking we had got.

Thursday, August 27th.—Started again when boat floated at 5 a.m. ; wind moderate from N.W. ; had made good about 10 miles when fell calm. 9 a.m—Passed some Eskimo tents, three men came out in kyaks and wanted to barter for powder and tobacco ; they said in going by commotik to where we had come from we would have to sleep two nights. We rowed until late in afternoon and then obtained a good harbour, anchoring behind an island in a perfectly sheltered spot. Waters in these parts alive with seals and porpoises ; saw one immense walrus ; I had a shot at him, and hit him hard, but did not kill him.

Friday, August 28th.—We grounded last night again for about two hours; tide like a mill-stream. Started at 5 a.m.; tide coming in; foolishly did not keep near shore and got into current; took two hours going less than a mile, sail set, wind fresh and fair, three men rowing; wind moderately fresh and fair all day; made run of, I suppose, 40 miles, but by dark had failed to find harbour; had to anchor in an exposed place; saw two Eskimo; they say 8 days by commatik from this to Ungava.

Saturday, August 29th.—Under way again at daylight; scarcely any wind all day; by rowing and sailing may have made 15 or 20 miles; shore continues low. No harbour again to-night; turned in about 7 o'clock. Half an hour after one of the men called out that boat was half full of water, and so it proved; everything wet, instruments, chronometer, bags—everything. In trying to find plug-hole shoved both my arms with shirt and coat-sleeves into water. Slept in wet things as I had not a change; miserable night. How the plug came out I cannot imagine.

Sunday, August 30th.—Wind light from E.; no use trying to get on, so sought a harbour in order to dry some of the things. Found what seemed to be good one; 25 feet water at flood-tide, but a few hours after anchoring we were high and dry with no water to be seen in any direction; day raw and cold, threatening rain; very unsuccessful as to drying clothes. Tide came in again at 7 o'clock; just getting dark; saw boat safely anchored, and turned in prepared to turn out again about one o'clock in order to see that she landed on a sandy spot when the tide went out. At 2 a.m. she grounded satisfactorily, and I slept soundly until the water returned at 8 a.m. Tide here runs like a sluice; spring tides, I suspect, about 40 feet.

Monday, August 31st.—Under weigh at 8 a.m.; good N.N.E. wind all day; must have made between 40 and 50 miles. No harbour at night; anchored in two fathoms at low water, about a mile from shore; spent sleepless night, as wind freshened from N.E., and sea began to rise. At 11 p.m. thought myself in fix, but wind again fell light.

Tuesday, Sept. 1.—Started at daybreak; very light N.W. wind until about 10 o'clock; after this it freshened from N.E. with a threatening sky and occasional showers. Determined to seek a harbour early, so headed for a point which I judged could be made by 4 p.m. What a very lucky hit; this Point had a beacon on it, and proved to be at the entrance to the Ungava River. Round the Point we came to a cove on the shore of which was a log-fishing shanty, A man—a white man—the first we had seen since last September. came out to us in a boat. He proved to be an employee of the Hudson Bay Co., and was attending a salmon net. He informed us that the Hudson Bay Co's steamers *Labrador* and *Diana* were both at the post, which was 25 miles up the river. He showed us where to anchor, telling us it was useless trying to ascend against the ebb-tide. We went ashore to his shanty; he cooked us some fresh salmon and gave us some hot coffee with biscuit and butter. Never in my life had I enjoyed a meal so much before; never do I expect to enjoy one more thoroughly in the future. I turned in after this delightful supper, but did not close my eyes.

The south side of Prince of Wales' Sound is high and precipitous. In a fjord where I lay, 22nd to 24th, fair anchorage about two miles up near a waterfall of over 400 feet.

From Cape Hope to about lat. 60°; high land back in interior, but coast line low; rocky islands, reefs and shoals for many miles out.

On 30th passed inside some much larger and bolder islands, Ackpatok lying outside, and from this to Ungava River the shore seemed more open and clear of reefs. We saw a few bergs on 26th and again on 28th. I consider that the west coast of Ungava Bay is quite unfit for purposes of navigation, owing to the numberless reefs and rapid tidal currents. The spring tides are over 30 feet in northern portion and about 60 feet near the mouth of the Ungava River. We saw a few natives at different points along the coast.

I append the following list of Eskimo words, which I picked up, with their English equivalents :—

English.	*Eskimo.*	*English.*	*Eskimo.*
One	At-ousik	Coat	Koal-a-tuk
Two	Ma-cook	Skin	Kesheke
Three	Ping-ushoot	Small seal	Netchik
Four	Sheetimut	Large seal	Oog-duke
Five	Dudlimut	Seal oil	ook-chuk
Six	Pinga-she-ook-took	Island	Kik-it-tuk
Seven	do. atousicklou	White bear	Nan-ook
Eight	Sheetimaooktook	To-day	Ooblumie
Nine	do. atousiclou	Yesterday	Ik-buk-chuk
Ten	Dudlimaooktook	Me	Oovenir
No	Ow-kuk	You	Igvete
Yes	A-hi-lah	Yet	Suly
I don't know	Ah-chuke	Only	Keshani
Water	E-muk	House	Igloo

English.	*Eskimo.*	*English.*	*Eskimo.*
Ice	Nee-luck	Tent	Toopik
Deer	Took-too	Gun	Cook-e-ook
White people	Cublunac	Powder	Ogjid
Eskimo	Inhuit	There	Tomahny
Snow	Ah-poot	What	Chu-ah
Rain	Cheila-lou	Duck	Meet-uk
Fog	Duck-took	Gull	Now-yer
Broken ice	Chik-oo	Ptarmigan	Ah-hag-yer
Spring	Oopin-uk-chuk	A hill	Kuk-kuk
Summer	Oopin-ark	Land	Noon-ah
Autumn	Ook-e-ark	Sun	Chuk-in-uk
Winter	Ook-e-ook	Moon	Tukir
Good	An-an-uk	Sister	Na-yung-a
Bad	Pu-ūn-eakput	To-morrow	Cowkput
Death	To-ko	Day after to-morrow	Cowk-put-a-lou

ELEVENTH MEETING.

The Eleventh Meeting was held on 13th February, 1886, the President in the chair.

The following list of Donations and Exchanges was read:

1. Journal of the New York Microscopical Society, Vol. I., No. 8.
2. School of Mines Quarterly, Vol. VII., No. 2.
3. Science, Vol. VII., No. 157.
4. From the New Jersey Historical Society:
    (1) New Jersey Archives. First Series, Vol. I. to VIII.
    (2) Proceedings of the New Jersey Historical Society. First Series, I., III., IV., VI. to X. Second Series, I. to VII.
5. Harvard University Bulletin, No. 33.
6. Electrical Review, February 13, 1886.
7. Appleton's Literary Bulletin, No. 43.
8. The Chemical News, January 29, 1886.
9. Imperial Federation, February 1, 1886.
10. Transactions of the Manchester Geological Society, Vol. XVIII., Parts XII. and XIII.
11. Cosmos, 25 Janvier, 1886.
12. Electricité, 23 Janvier, 1886.
13. Revuede Linguistique et de Philologie comparée, Tome 19^{me}, Fascicule 1er.
14. Bullettino della Sezione Fiorentina della Società Africana d' Italia, Vol. I., Fas. 6^{e}.
15. Wochenschrift des oesterreichischen Ingenieur und Architekten Vereines, 22 Januar, 1886.
16. Annales des Mines, 8^{me} Série Tome VIII, 5^{e} Livraison de 1885.
17. Atti della R. Accademia di Belle Arti in Milano, 1884.
18. Journal für Praktische Chemie, 1886, No. 1 u. 2, Leipzig.

19. Beiblätter zu den Annalen der Physik und Chemie, 1886, No. 1.
20. Journal des Sociétés Scientifiques, 27 Jan., 1886.
21. (1) Notice sur l'École centrale des Arts et Manufactures, 1883, Paris.
    (2) Programme des Conditions pour l'Admission des Eleves.
    (3) Arrête Ministériel, 24 Mai, 1862.
22. Atti della Società Veneto-Trantina di Scienze Naturali residente in Padova. Vol. IX., Fascicolo I., II.

Total, 48.

The following were elected members : H. Piper, Adolphus Baxter, and Anthony McGill, B.A.

The President, on behalf of Mr. A. C. Lawson of Ottawa, read a paper entitled : " Some Instances of Gneissic Foliation and Schistose Cleavage in Dykes and their bearing upon the Problem of the origin of The Archæan Rocks."

The phenomenon of gneissic foliation and schistose structure in rocks is so many-sided in its character, and so far reaching in its bearing upon the elucidation of important problems in archean geology, that a comprehension of these physical characters, sufficiently adequate for the formulation of an acceptable theory explanatory of their origin and development, is one of the great desiderata of the geological science of to-day. Such a comprehension can only be arrived at after careful and intelligent sifting of evidence gathered by much patient research in many fields. That we are as yet far from having accumulated sufficient evidence upon which to base a reliable and consistent hypothesis will be conceded by all geologists who have gone, hammer and compass in hand, into the archean field and faced the problems there presented. In the whole range of geology, whether we regard it from a purely philosophic or a strictly economic point of view, there is no more important general question to be solved than that of the original character and present structure of the archean system of rocks ; and for the solution of that question one of the great rëagents that is lacking, is, I believe, a good working hypothesis, or, if necessary, two distinct hypotheses that will give us the most highly probable explanation of these two phenomenal rock structures, viz.: gneissic foliation and schistose cleavage.

They are both so familiar and commonplace to all geologists that objection may be made to classing them as phenomenal, but so long as they are without a rationally consistent explanation they may fitly be so termed, since the more these rocks are studied the more is one impressed with the actual mystery that as yet veils their natural history from our view. There have been, indeed, many speculations on these problems of foliation and cleavage, and provisional theories, such as the existing state of knowledge warranted, have been accepted. But speculations devoid of a broad foundation of accumulated facts, and theories that have survived their usefulness, become in time pernicious encumbrances, instead of aids, to the advance of science, and must yield always to more and more substantial beliefs, as vigorous and intelligent investigation proceeds.

In the working out of archean geology the theory of metamorphism has been a powerful stimulant to research and has given us many valid results which entitle it to hold a place of the greatest respect in the history of the science. It has, however, fallen short of its aims in the two chief objects which it has ostensibly sought to accomplish, viz.: (1) the formulation of a consistent and acceptable account of the original character of the archean rocks; (2) the furnishing of a key that will enable us to solve their present structural complications. The great truth the theory of metamorphism has established for science is the fact, that there is *a* metamorphism to which all rocks are susceptible; but its attempt to find in this metamorphism the complete explanation of the profound problems of the old crystalline rocks, is a delusion which must sooner or later be abandoned by geologists as freely as it has been firmly and generally believed in. It is difficult to find a definite enunciation of all that the metamorphic theory of these rocks means. The general proposition, however, that it endeavours to sustain is, that the archean rocks were originally ordinary sedimentary strata which by a process of mineralogical changes or "metamorphism" have become altered into the highly crystalline rocks we know to-day. This proposition, which was once generally accepted, is now fast losing its hold upon geological belief, if we except, perhaps, that of the conservative English school. The many and fundamental objections to the theory have never been satisfactorily reasoned away, while much of the evidence in its favor is based upon assumption. I do not propose to attack the metamorphic explanation of the archean rocks in general, but simply to call attention to two assumptions which the theory both implies and finds support in, advancing such facts as I have been able to observe, which tend to prove the unreliable nature of the propositions assumed to be true. These propositions are :

(1) That gneissic foliation is a proof of bedding.

(2) That cleavage or schistose structure is peculiarly developed in sedimentary rocks.

I shall endeavour to show by an array of instances to the contrary (1) that gneissic foliation is no proof of bedding; and (2) that both gneissic foliation and schistose cleavage may be developed in true igneous rocks. The instances referred to are taken from the Lake of the Woods region, where I have had some opportunity of studying the archean rocks in their various aspects.

On an island in Sabascosing Bay, Lake of the Woods, a band of black hornblende schist runs through the gneiss. The lamination of the schist, the foliation of the gneiss and the line of contact are coincident in direction, striking 150°; and the common dip is to the north-east. The line of junction is crossed by one branch of a forked dyke half a foot wide, as represented in the accompanying diagram (Fig. 1) :—

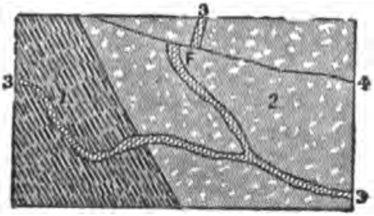

FIG. 1.

Laminated gneissoid dyke cutting gneiss and hornblende schist. Island in Sabascosing Bay, Lake of the Woods.

1. **Coarse textured gray gneiss.**
2. **Black hornblende schist.**

These two rocks are in conformable contact with a common strike of 150° and dip to north-east.

3. **Dyke about ½ ft. in width, faulted at F, granitic in composition, but presenting a well-marked gneissic lamination in structure.**
4. **Fault cutting schists and dyke.**

A small fault crosses the schist and has caused a dislocation, the extent of which is seen by the movement of the dyke along the line of fracture. The dyke is granitic in its composition, containing feldspar, quartz and mica, *and has a well-marked gneissic foliation of the crystals parallel to the containing walls of the dyke.*

On a small island in the central portion of the lake, situated about two miles north of the mouth of Astron Bay, the rock, which is here a coarse dioritic or ash-bed agglomerate schist, is traversed by a granitic dyke striking 40°, with the cleavage and longitudinal axes of the agglomerate fragments in a nearly vertical attitude. The ground plan of the dyke is given in the accompanying diagram (Fig. 2).

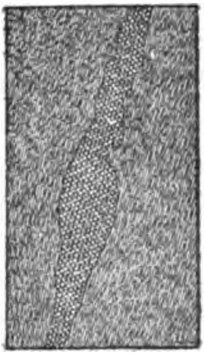

FIG. 2.

The dyke is of irregular width, has a ragged edge, which at places includes portions of the schist, and is, therefore, taken to be an actual intrusion. Its width varies from one to four feet, and about 21 feet of its length is shown. It is of a dark gray color, is coarsely crystalline, and has the composition of a highly feldspathic granite, but *the crystals have a well-marked foliated arrangement parallel to the strike of the dyke.*

Two and a half miles south-west of Yellow Girl Point, Lake of the Woods, lies a small island about four chains in length from east to west and about two in width. The island is composed of evenly laminated hornblende and micaceo-hornblende schists striking east and west with a northerly dip at a very high angle. At its widest part, the schists of the island, which are quite bare and well exposed, are cut by a curved north and south striking dyke about 15 feet wide, whose relation to the schists is shewn in Fig. 3.

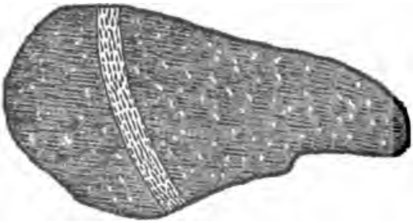

FIG. 3.

The schists abut sharply on the dyke on both sides and there is no appreciable difference in the strike of the schists on one side from that on the other. The rock of the dyke is syenitic in composition, being composed of a preponderance of a pale yellowish pink orthoclase with a black variety of hornblende and some quartz, plagioclase and mica. *The dyke presents an unmistakable gneissic structure* which is best developed along its sides, the rock being more undifferentiated and granitic in the central portions.

The island lies a little to the north of a larger island (Beacon

Island), the north shore of which is occupied by hornblende schist and finely laminated quartzose mica schists, while the southern half of it is occupied by a mass of flesh-tinted rock of the composition of a syenitic granite, but in which, in places, there is developed, in the same rock mass, a very distinct though coarse gneissic foliation, with gradations between what would be taken as a true granite and the unmistakable gneiss, which preclude the possibility of any hard line being drawn between them, both being in fact the same rock—a granite. The gneissic foliation is due to a structural differentiation, which, so far as observation would permit of judging, is more especially peculiar to that portion of the mass nearest the contact with the schists. The dyke on the small island shewn in the figure is probably an off-shoot from this granitic mass.

Along the junction of the Huronian hornblende schists with the Laurentian gneiss on the islands at the mouth of White Fish Bay, may be seen some remarkable instances of *intrusions which have all the physical aspect of a regular gneiss.* The most striking of these is figured in the annexed diagram (Fig. 4), which illustrates the condition of things seen on an island called the West Pointer at the mouth of the bay.

The northern and larger moiety of the island is occupied by the hornblende schists of the Huronian, and the southern by coarse grey gneiss. About the middle of the island the irregular intrusion of gneiss shewn in the figure breaks through the hornblende schists. The intruded rock resembles closely the regular gneiss to the south of the line of contact and its foliated character is quite as well defined. The irregular nature of the fissure through which this gneiss has been injected is such, that it cuts across the schists at some places and runs with its strike in others. The foliation of the contained gneiss is approximately parallel to the walls of the fissure. In one place this foliation and the

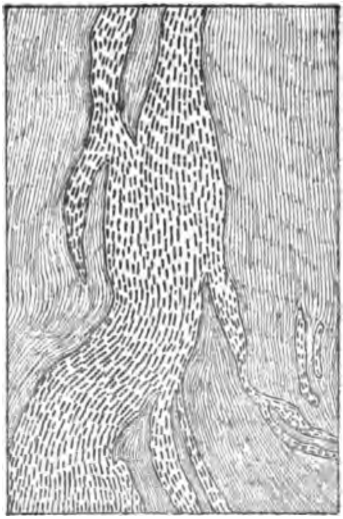
FIG. 4.—Scale—1 inch = 10 feet.

general axis of the dyke have a coincident strike of N. 55° W., while the schists which abut sharply on the dyke have a strike of N. 80° E.

The intrusion is, I believe, identical with the gneiss of the Laurentian to the south, and is a striking proof of the plastic or viscid condition in which these rocks must have once been, either as an original state or as induced at the time of folding. The belief that this intrusion of gneiss is the same as the Laurentian gneiss of the region to the south, and that it is simply a portion of the latter that has been injected in a molten state within the rocks in which it is now found, is based not only on the similarity of the rocks, but also on the nature of the line of contact at this point, which in the conditions represented in Fig. 5 gives us another proof of the once viscid condition of the rocks.

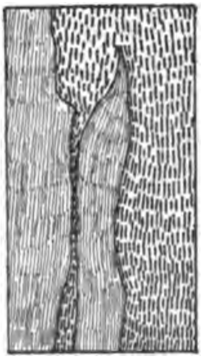

Fig. 5.

The gneiss and the schists here are the same in every way as those described in the preceding figure which occur only a few yards to the north. The wedging of the two rocks one within each other in the way represented finds its readiest explanation in ascribing a plastic or viscid condition to the rocks at the time of this folding under enormous pressure. This condition of things along the line of contact is, it may be mentioned, somewhat abnormal, the rule being that the hornblende schist presents an even line of junction with the gneiss, strictly conformable, so far, at least, as parallelism of the planes of foliation of the gneiss, cleavage and bedding (not necessarily sedimentary) of the schists, together with transitional alternations of beds of gneiss and schist may be taken as indicative of conformability.

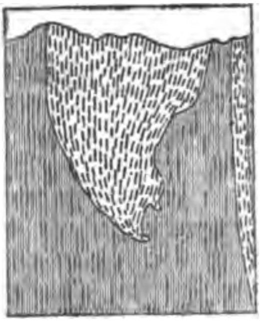

Fig. 6.

Another instance of intrusive gneiss breaking through schists is seen on the extremity of Rendezvous Pt. in Long Bay. Here, as seen in Fig. 6, an irregular wedge of distinctly foliated gneiss juts in from the shore line within the schists, presenting all the characters in its contact with the adjoining rock of an intrusive mass.

It is a coarsely crystalline gray gneiss. A little to the south is a narrow band of gneiss striking with the schists, of which it would be difficult to say whether it was a dyke or an interbedded stratum. Its origin is probably the same as that of the larger and more distinctly intrusive mass to the north of it. The aspect of the rock surface on the point in question is shewn in the annexed Fig. 6.

At the extremity of Spear Point, on the route between Rat Portage and French Portage, the mica schists, which constitute the rock of the point, are cut by an irregular dyke of a porphyritic dioritic rock, striking N. 60° E., with the schists as shown in Fig. 7.

The dyke has a very ragged edge and its intrusive character is undoubted. It varies in width from two feet to a very few inches. The dyke weathers a yellowish white, and presents a surface finely pimpled with thickly disseminated crystals of feldspar, which have been more resisting than the matrix of the rock to weathering agencies. These crystals show a distinctly foliated arrangement, and give the rock the aspect, though it has not the composition, of gneiss. The foliation is parallel with the general strike of the dyke, and in addition to its gneissic structure is quite schistose.

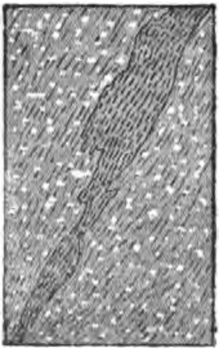

FIG. 7.

The mica schists which occupy the north end of Hurricane Island are cut obliquely by a ragged-edged dyke of whitish yellow weathering dioritic rock, which is distinctly schistose. The mica schists have a strike of N. 60° E., while the dyke and its planes of schistose fracture strike about N. 40°E. The following Fig. 8 shows the relation of the dyke to the schists on the ground plan.

On the west shore of Sabascosing Bay the gneiss at one point is cut by a band of hornblende schist, of which neither the dyke-like character nor the schistose structure can be doubted. It is from one and one-half to two feet wide, and strikes N. 50° W. across the gneiss, the direction of whose foliation is N. 75° E. The dyke lies, as is shown in Fig. 9,

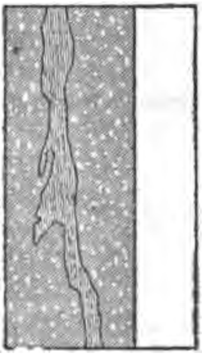

FIG. 8.

between two other dykes of fine-grained gray granite, one nine feet wide on the north-east side and one one foot wide on the south-west side. All these dykes fault the rock, as is seen by the non-correspondence of the gneiss at points directly opposite each other, and by the slight torsions of the nearly vertical planes of foliation.

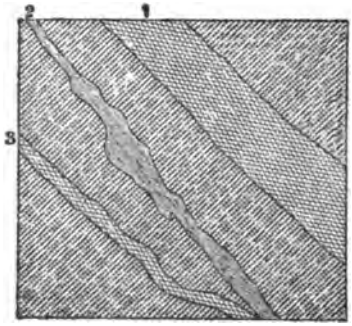

FIG. 9.

Schistose dyke, between two granitic dykes, cutting and faulting gneiss Sabascosing Bay, Lake of the Woods.

1. Granite dyke, 9 feet wide.
2. Dyke of laminated and schistose amphibolite rock—hornblende schist.
3. Granite dyke, about 1 foot wide.

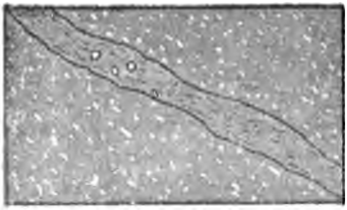

FIG. 10.

On the north-west corner of Oak Island there cuts the hornblende schists a very schistose dyke of a rock, composed of hornblende, mica and feldspar, containing brecciated fragments of a highly feldspathic gray granite (Fig. 10). The dyke is from two to four feet wide, and traverses the schists across their strike. The included fragments are not numerous, but present the aspect of true brecciated inclusions.

These instances appear to prove conclusively that a gneissic foliation may be developed in a granitic rock that was at one time viscid or flowing enough to be injected within fissures of other rocks; and also that a schistose structure may be developed in igneous intrusions. Omitting for the moment all considerations as to the causes to which this foliation and schistose cleavage may be ascribed, these conclusions have an important bearing upon the possible original character of some of the archean rocks, especially if by careful research and accumulation of evidence it be found possible to extend them from the special to the general. If from admitting the development of a gneissic foliation in an undoubted igneous rock we admit the possibility of the great Laurentian system of rocks which are granites or syenites in composition but gneisses in structure, having been in a fluid state, we take a great step towards removing the necessity for a theory of metamorphism which ascribes a sedimentary origin to these rocks. It may, indeed, be urged that the metamorphic theory admits a once viscid condition for these rocks and that this state was only the extreme of metamorphic action, but the moment the theory admits this it removes at once its *raison d'être* and becomes a far-fetched and cumbersome hypothesis to explain phenomena that can be accounted for in a far simpler way. For it is absurd to admit the development of a gneissic foliation in a granitic magma whose fluid condition has been brought about by the action of heat on once solid strata, and to deny the possibility of a similar differentiation in the original granitic magma or fluid, which is generally conceded to have constituted the first surface of our globe. The development of a foliation in a magma which is such *ab origine* is as easily conceivable as that in a magma which is only such secondarily, and is far simpler as a scientific hypothesis, in the fact that it avoids the necessity of imagining an immense process of sedimentation of a most peculiar character, and leaves us as far as ever from the beginning in attempting to trace out the history of the earth's crust from the time of its molten state.

As a general rule, however, the exponents of the metamorphic explanation of the archean rocks do not carry their contentions quite so far as this. The Laurentian gneisses, they say, are sedimentary rocks, which, though in the process of metamorphism they have been reduced to a plastic condition, have never been rendered so completely homogeneous as to lose all traces of sedimentation, which traces are manifest in the parallelism of the planes of crystalline foliation; further, that many granites are but gneisses that have undergone this extreme stage of metamorphism and so had these traces of sedimentation quite obliterated. This of course puts the question on much more debatable ground; but if it can be shown that, in true igneous rocks, which, if our ordinary conceptions of intrusive phenomena are to stand, must have been in the condition of a fluid magma, a distinctly gneissic structure may be developed, as I have shown to be the case in the instances cited, then the argument that gneissic foliation is an indication of bedding is terribly shaken; and if, further, by extending observation, the foliation of gneisses generally can be shown to be due to similar forces operating on similar material, the metamorphic theory must go to the wall as a needlessly far-fetched and complicated hypothesis. I am well aware that the metamorphic theory is not altogether based on the structure of gneisses, nor do I deny that there is a metamorphism to which rocks are susceptible, but as an explanation of the origin of the Laurentian gneisses it seems to be very weak, particularly where it seeks for support in the assumption that foliation in these rocks is proof of sedimentation.

If we consider for a moment the probable causes of the differentiation of a granitic magma into a foliated gneiss, such as occurs in dykes of gneiss, we shall find that pressure was in all likelihood the most important force at work; further, that this pressure was due not to external disturbance but to internal changes; that it was, in fact, the pressure due to the expansion of the injected material during the process of solidification within confining walls practically rigid. Wadsworth has pointed out in his Lithological Studies the high probability of rock magmas following the rule found to hold in many of the economic metals. These expand rapidly during the actual process of solidification, so that when solid, but at a temperature only slightly below the point of fusion, they have a lower specific gravity than when in the fused state; though in cooling from this temperature the solid contracts so much as at the normal temperature to have a specific gravity higher than that of the molten fluid. An expansion of this kind in a dyke solidifying by crystallization can be readily imagined to have had a very potent influence upon the arrangement of the nascent crystals. The pressure would of course be equal in all directions if the magma were a perfect fluid. As crystallization proceeded, however, the pressure would act more and more in directions perpendicular to the planes of resistance, *i.e.* to the walls of the dyke, and as a consequence the crystals would be forced to assume positions in which their longest diameter would be parallel to the lines of least resistance. Such an explanation of the development of a gneissic structure in dykes may be extended with some probability of truth to the gneisses of the Laurentian, particularly those usually referred to as granitoid gneiss. The crumping and folding of the archean rocks is generally ascribed in textbooks to a process of contraction, due to the cooling of the earth's crust or to the contraction of the interior molten globe, and the consequent collapse upon it of the less rapidly cooling crust. This explanation is probably the true one to account for the folding of post-archean strata, and much of the disturbance that affects the archeans themselves is doubtless due to the operation of such forces. But if it be admitted that the Laurentian gneisses ever so far resembled intrusive gneiss as to have been in the condition of a molten magma, then we have a prior and more important force to take into consideration, viz., the expansion of solidification at the time when the rock was passing from the fluid to the crystalline state. Such an expansion would be amply sufficient to throw the solidifying but yet plastic rock into the violent folds and contortions in which we to-day find the fundamental gneiss wherever it is exposed the world over. The same expansive pressure would, as in the case of the dykes, have a decided tendency to arrange the precipitated crystals in a more or less definite way with their longest diameters parallel to the line of least resistance, *i.e.* parallel to the axes, whether straight or curvilinear, of the folds. This tendency to gneissic arrangement would be aided by the pulling and flow that would necessarily be induced by the folding of such a partially crystalline still plastic mass. This seems to me to be the most plausible hypothesis to account for the origin of the granitoid gneisses of the Laurentian, and it is certainly more in harmony with the phenomena we find in the archean field than a theory which holds that they are the altered remains of once aqueous sediments. The marvellously intricate contortions and intermingling of the gneiss seen not only on natural exposures in the Lake of the Woods region, but also in some railway cuttings between Port Arthur and Winnipeg, leave room for no other conception than that the gneiss must have been in a perfectly viscid condition. It is not at all probable that the explanation advanced to account for the origin of the granitoid gneisses is true of the more finely laminated and bedded gneisses that appear to occupy a higher position in the Laurentian system. This lamination can, without serious objection, be ascribed to regularity of crystalline precipitation, a stratiform arrangement due to difference of specific gravity in different portions of the original magma, and to the variation of the fusion point of crystallizing minerals according to the proportion of other minerals present, all of which forces would have freer play near the surface, where the composition of the magma would be less constant and the superincumbent pressure be less.

The contraction which these rocks have undergone must have taken place at a period subsequent to their assumption of the solid state, and would, therefore, naturally have an immensely less chance of exerting a modifying influence upon the arrangement of their component crystals than forces at work while it was yet plastic. The results of such contraction are probably seen in the innumerable fissures that traverse Laurentian rocks, and are now filled with pegmatite granite and other intrusive material. The fact that, as a rule, there is an extremely small amount of dislocation attending these fissures favours the view that they are due to contraction of the solid rock rather than to any kind of upheaval or similar disturbance. It is, moreover, to be observed that the crumpling and folding of the original surface of the earth, due to the expansion of solidification, would, by the natural balance of physical forces, be prevented from extending to excessive depths. The pressure due to the weight of the upper portions of the globe's forming crust would at a certain depth counterbalance the pressure of expansion, and long before this point was reached the tendency to folding would be checked. The solidifying magma would expand quietly and uniformly in all directions till equilibrium was established, when, the resistance from above being equal to that in other directions, there would be no tendency to differentiation in the arrangement of the crystals. The resulting rock would be the granite, into which gneiss is often seen to graduate when denudation has exposed the lower portions.

If we now pass on to consider the question of schistose cleavage, we find that the instances cited show that such a cleavage may be developed in igneous or intrusive rocks. This schistose structure appears to be closely allied to gneissic foliation, though a rock may be distinctly gneissic, and yet not at all schistose under the hammer. Both are probably due, so far as dykes are concerned, to the same causes. It is scarcely necessary to remark that there are two kinds of cleavage, one due to a parallel arrangement of the foliated minerals in the rock, produced very probably by the operation of the same forces as those to which the foliation of gneiss is ascribed, and which may, therefore, be properly said to be allied to it; and another which crosses the strike of the lamination and seems to have been developed in the rock as a species of fine jointing after its assumption of a hard solid state. Both kinds may often be seen cleaving the same rock, but only the former will now be considered briefly, as it is that which prevails in the upper or schistose portion of the archean system. That such a schistose cleavage may be developed in igneous rocks is shown by its occurrence in intrusive dykes. It is not, however, only under the conditions in which dykes occur that this cleavage may be developed in igneous rocks, for on a larger scale I have repeatedly observed perfectly massive and homogeneously textured rocks of a diabasic or dioritic composition merge into a schistose variety of the same composition and aspect, without a break to create a doubt as to the identity of origin of both. Further, I have noticed that even granite, which is unmistakably intrusive, may exhibit a rough but quite well-marked schistose fracture. This is well seen on the northern skirts of the Echo Bay (Lake of the Woods) intrusive mass of granite, which breaks through a diabasic rock, and near its contact with the latter becomes less coarsely granular and roughly schistose.

If, then, a schistose cleavage may be developed in a truly igneous rock, the mere fact that the higher portions of the archean system are characterized by such a schistose cleavage, even though it be parallel for the most part with the stratiform arrangement or bedding of the rocks, is no reason whatever in support of the belief that these rocks were once aqueous sediments.

In answer to a question of Mr. Rouse respecting the expansion of rocks in cooling, Dr. Ellis referred to a number of substances that expand in the act of solidifying, and entered into an explanation as to the cause of the expansion in such cases.

Mr. T. Nelson Dale stated that the views of the paper agreed with those of Professor Hitchcock, the State Geologist of New Hampshire, who regarded large masses of gneiss in the White Mountains as of igneous origin, but that there were cases where gneiss was undoubtedly of metamorphic origin; thus Beudant, one of the old French geologists, cites a case of a dyke of igneous rock which, in its passage through a bed of argillite, had metamorphosed contiguous portions of it into quartz, feldspar and mica. If the rock in such a locality retained traces of its original bedding, or if the crystalline particles assumed a parallelism in the direction of least resistance, we should have metamorphic gneiss. Mr. Dale had visited, during the previous summer, a locality in Massachusetts where fine-grained gneiss was inter-bedded with mica schist, both evidently of metamorphic origin. The paper was an instructive one, and would promote just views on the subject. The upshot of the present difference of opinion on the origin of gneiss would probably be that it would be determined that gneiss might be either of igneous or of metamorphic origin.

Mr. VanderSmissen introduced Mr. C. N. Bell, of The Manitoba Historical and Scientific Society, who gave an interesting account of the Mounds of Northern Minnesota, Manitoba, and the Rainy River Valley, and of the contents of those at the opening of which he assisted. He exhibited a photograph of a copper hook found by Mr. Richardson, a C. P. Railway surveyor, at the bottom of a deep pocket in the Laurentian rocks, 30 feet below the surface, on the bank of the Pic River. In answer to a question from Mr. VanderSmissen, he gave some figures as to the cost of the exploration of these mounds.

Mr. Boyle moved a vote of thanks to Mr. Bell, which was seconded by Mr. Bain and carried.

TWELFTH MEETING.

The Twelfth Meeting was held on 20th February, 1886, the President in the chair.

The following list of Donations and Exchanges was read:

1. **Le Naturaliste Canadien, Vol. XV., No. 8.**
2. **From Cornell University, Ithaca, N.Y.:**
   (1) Annual Reports of the President for 1881, 1883, 1884, 1885. None published for 1882.

(2) Bulletin of Cornell University (Science), Nos. 1 and 2.
(3) Second and third Reports of Cornell University Experiment Stations, 1882-83, 1883-84, 1884-85.
(4) Notes on the Geological History of Cayuga and Seneca Lakes, by C. W. Foote.
(5) Ithaca and its Resources, Kurtz, 1883.
(6) Library Bulletin of Cornell University, Vol. I., Nos 1-13.

3. Science, Vol. VII., Nos. 158 and 159.
4. The Iowa Historical Record for January, 1886.
5. Bulletin of the California Academy of Science, No. 4, January, 1886.
6. The Chemical News, February 5, 1886.
7. Illustrated Journal of Patented Inventions, No. 58, February 5, 1886.
8. Scottish Geographical Magazine, Vol. II., No. 2, February, 1886.
9. Journal of the Quekett Microscopical Club, Series II., Vol. II., No. 14, February, 1886.
10. The Lancet, London, January 23rd, 1886.
11. Midland Naturalist, No. 98, February, 1886.
12. Proceedings of the Royal Geographical Society, Vol. VIII., No. 2, February, 1886.
13. Records of the Geological Survey of India, Vol. XVIII., Part 4, 1885.
14. Electricité, 30 Janvier, 1886.
15. Wochenschrift des oesterreichischen Ingenieur und Architekten Vereines, Wien, 29 Januar, 1886.
16. Gazetta Chamica Italiana, Palermo, Anno XV., 1885, Fascicoli I.-IX.
17. Bulletino della Società Geografica Italiana, Ser. II., Vol. XI., Fasc. I., Gennaio, 1886.
18. Bulletino di Bibliografia e di Storia delle Scienze Matematiche e Fisiche. Tomo XVIII, Aprile, 1885, Roma.
19. Società Storica per la Provincia e Antica Diocese di Como, Vol. 5° Fasc, 17°.
20. Compte Rendu de la Société de Géographie, 1886, Nos. 2 et 3, Paris.
21. Mémoires de l'Académié des Sciences, Inscriptions, et Belles Lettres de Toulouse, Hintième Série, Tome VII., Premier et Deuxième Semestre, 1885.
22. Mémoires et Compte Rendu des Travaux de la Société des Ingénieurs Civils, Septemtre, 1885.
23. Journal des Sociétés Scientifiques, 3 Févirer, 1886.
24. Zeitschrift für Physiologische Chemie, X. Band, 1 u. 2 Hefte, Strassburg.

Total, 56.

The following were elected members: Rev. J. F. McCurdy, Ph. D. D. J. Gibb Wishart, B.A., M.D., Thos. J. Burgess, M.D.

Mr. David Boyle read a paper on "The Persistence of Savagery in Civilization."

The key-note to this paper was struck in the following sentence: —"As pre-natal life appears to present us in epitome with a history of the development of our race from a merely animal point of view, so does our existence, in its various stages, from the cradle to maturity, exemplify the steps in man's advancement from the condition of the untutored savage to that of a civilized being."

The writer claimed that nearly every one of our "manners and customs" betrays its lineage with some aboriginal proclivity, some instinct, or some acquired tendency which had for its main object the securing of a supply of food.

On this basis Mr. Boyle accounted for the stone-throwing proclivity on the part of boys; and with advancing years, for their indulgence in the use of pea-shooters, slings, bows and arrows, revolvers and rifles.

Cruelty to animals, cocking-mains, pugilism, and man-bull fights were traced to the same savage source. Sports and games were regarded as improved forms of old hand-to-hand encounters.

Music and dancing were rhythmical arrangements of sound and motion, but connected with the celebration of victories in war, dancing especially still showing mimic capture and recapture by contending parties.

Fondness for raw meat and for putrescent vegetable matter led the writer to the love of the human race for stimulants, and he asked whether it would not "be rash to say that the desire for intoxicants had not its origin in some instinctive and impelling longing to satisfy a want in the human organism?"

Of the jack-knife carver on every available surface, the remark was made: "He is a nineteenth century survival of Cave Man, and refrains from committing murder only because he has a wholesome regard for the terrors of the law."

Personal adornment and love of display were the results of evolution from the days of paint and feathers.

In concluding, the writer said, "The customs of modern society, the refinement, the æstheticism of the present day are but evolutionized forms of those natural expressions of instinct and of crude sentiment that are so characteristic of savage life wherever it exists. . . . That many of our proclivities bear so strong a resemblance to savagery, is not only a proof of the "Descent of Man," but goes a long way to show how exceedingly brief has been his so-called civilized condition compared with the endurance of his primeval state. . . . To acknowledge the prevalence of crime, is simply another mode of stating that civilization has not yet reached its highest attainable form."

Mr. C. N. Bell, of Winnipeg, read a paper on "The Mound Builders in Canada."

The scientific journals of the day are over-flowing with articles on the mound builders. Some writers take decided ground in claiming for the builders a remote antiquity, while others are equally positive in asserting that they were the immediate ancestors of our modern Indians. One becomes rather bewildered on finding that prominent champions of the above opposing theories rearrange themselves under different standards when the question arises as to where the Mound Builders came from. While some stoutly maintain that they were an offshoot from Central American stocks, many are confident that they came from the north. An immense number of data are produced as evidence in support of each one of these theories, but one fact seems to have been at least partially overlooked by writers. It is more than passing strange that no systematic attempts have yet been made to follow up towards the north the broad lines of mounds and other earthwork remains left by the mound builders. An immense number of mounds exist in Northern Minnesota and Dakota north of the valley of the Mississippi, and yet little has been done to survey or explore them. Two gentlemen in St. Paul lately informed me that they had surveyed some thousands of mounds in Minnesota, principally, however, south of the source of the Mississippi, but the northern districts were yet virgin soil for the archæologists. Any information therefore that is forthcoming which extends northward the known limits of the mound builders' remains will be extremely interesting and valuable. Comparatively few archæologists are aware of the fact that the Mississippi River mound system merges into one ranging up to Lake Winnipeg, if not farther. In 1867 two of the ordinary burial mounds of the truncated cone form were discovered on the right bank of the Red River in Manitoba, or, as it was then called, the Selkirk settlement. Some interesting remains were taken from them, including human and animal bones and skulls; ornaments of shell, bone and stone; implements of stone, and pottery, all of which (like too many of our Canadian archæological treasures) were exported to enrich foreign museums. Little or no interest was taken in this matter for a number of years, and it is only lately that the Historical and Scientific Society of Manitoba and private individuals have learned of the rich field for research that lies at their doors. As the country becomes settled, reports flow in of the existence of mounds in different parts of the North-West It is definitely known that earthworks of various forms are grouped on many of the streams falling into the Red and Assiniboine Rivers, and the announcement was lately made that at least one mound stands at the north end of Lake Winnipeg, or roughly speaking, in N. lat. 54°, W. long 98°. It may be well to trace one connected line of mounds from down on the Mississippi River to Lake Winnipeg. The Red River of the North takes its rise (by one branch) in Lake Traverse or, roughly speaking, N. lat. 46 degrees, W. long. 97 degrees, and following north falls into the southern end of Lake Winnipeg. There is a connected line of mounds from Lake Traverse to Lake Winnipeg. Lake Traverse is connected by a sluggish creek with Big Stone Lake, which is drained to the south by the Minnesota River, the latter emptying into the Mississippi River, near the city of St. Paul, Minnesota. Mounds are found in numbers along the Minnesota River, from the Mississippi to Big Stone Lake, and there are several groups with an earthwork fortification at the valley situated between Big Stone Lake and Traverse. Hundreds of mounds in this district have been surveyed by Mr. T. H. Lewis, of St. Paul. It will thus be seen that there is a continuous line of mound from the Mississippi, below St. Anthony's Falls, to Lake Winnipeg, following that line of water courses, from the Gulf of Mexico to Hudson's Bay, which divides the North American continent into two great halves, east and west. A brief description of a group of mounds at St. Andrew's, Manitoba, 18 miles north of the city of Winnipeg, will serve to show that in general character they are almost identical with one class of those of the Ohio and Mississippi, as reported on by Messrs. Squier and Davis and other archæologists of the United States. One mound was 8 feet high, 75 feet long, and 65 feet wide. It was covered with a clump of oak trees, ranging up to about 4 feet in circumference, and thickly matted with small underbrush and roots. Under his supervision a trench was sunk from the apex to the base on one side of the centre, and running partially around it. First was encountered a layer of decaying vegetable matter, then the general material was a rich loamy earth, evidently gathered from the immediate vicinity, though no pits or excavations were found. As the cutting was, made patches of charcoal, ashes, and burned clay appeared, mixed irregularly throughout the soil to a depth of four feet. Below this level the ashes and charcoal were more regularly disposed in streaks, and in places the earth seemed to be burned, requiring the use of a pick to loosen it. At this level, also, the remains of some oak timber were uncovered at the west side of the mound, which covered the remains of a human being, interred in a sitting position. The wood was in such a state of decay that it crumbled to dust in the hand, though often showing the lines of fibre and growth, the dust being of a bright red color. In the upper section of 4 feet, amongst the scattered patches of ashes and charcoal mixed through the loam, were found a number of skeletons, evidently "intrusives," as some of them were in a comparatively fair state of preservation, the smaller bones only having disappeared. They had all been buried with the faces upward and were unaccompanied by ornaments or other manufactured articles. It was at once evident to me that they were later interments than the original remains found at the bottom of the mound. There is recorded the fact that during an epidemic of smallpox, about the year 1780, the Indians along the Red River buried their dead in the mounds in this locality, and which were not made by themselves. Without doubt, these "intrusives" found by me were the bodies of the smallpox victims, the Indians departing from their usual mode of scaffold burial to avoid contagion. The late Senator Donald Gunn was informed of this circumstance by an old Indian who had been a resident of the district at the date mentioned. On the level of the natural surface of the ground a platform or layer of round boulder stones was found, beneath a smooth burnt clay floor, apparently dipping lightly towards the centre, which I was unable to uncover at the time, and cannot accurately describe, but it very closely answers the description of the "clay altars" of Squier and Davis. The skeleton of a man of rather above the ordinary stature was found in a sitting position surrounded by several piles or bundles of bones, each surmounted with a skull. These bundles seemed to consist of the main bones and skull of one individual to each pile, and had evidently been brought there for reburial about the central figure. These remains were very much decomposed, crumbling into fragments on exposure to the atmosphere. Some of the bones of the right foot of the sitting skeleton were found in a lump of clay, but these were the only ones, with the main bones of the legs and arms and skull, which were preserved, though much care and trouble was taken. The skull is now in possession of Dr. Daniel Wilson, of Toronto. These remains were on the level of the surrounding ground on the west side of the mound and facing the east. The following articles were found near the sitting figure. About the position of the breast a polished seashell gorget, probably cut from the *Busycon perversum*. It is four inches in diameter with a circular hole in the centre of one-half inch diameter, and two small holes in the rim for suspension purposes, which show a well worn furrow or groove worn into the shell by the friction of the cord or thong. Like the skull, the gorget is stained with a mineral paint of a red color, but no attempt has been made to engrave designs on its beautifully polished surface. Two well-finished tubes of steatite, each hollowed out and having a raised rim at one end, were taken from about the waist. The tubes show that they were finished inside by cutting, as the stripe left by the tools may be seen. A tiny earthen pot came from the side of the skeleton, but it crumbled to pieces when taken from the earth. It appears to have been filled with red ochre or some such material, as the cup was stained red, and there was a crusted deposit inside. A few shell beads were found scattered through the earth of the lower level. Those secured were very much decomposed,, and split into thin scales or crumbled into chalky lime when exposed. The shells of the common mussel, which abound in the river close by, appeared at different levels, but they were generally much decayed. These shells have been found inside pots discovered in the mounds, and were evidently at times used as spoons and ornaments. A few hundred yards from the above mound was another, which has been opened and found to contain human and animal remains, earthen pots, rough stone mauls, deer horns, and a pin or hanging ornament 5¾ inches long and ¾ of an inch thick, formed from the columella of a sea shell, probably of the *Busycon perversum*. This pin is identical with some in the collection of the Smithsonian Institution, notably with one found in a mound in Tennessee. There was also taken from this mound a gorget or breastplate, 9½ inches long and 3 inches wide, with the ends curved. The material is very dry and brittle, and it is difficult to say exactly what it is, but in all likelihood it is a turtle shell. The marks of a scraper appear on the concave side, while the other is polished smooth and the surface indented with several lines running parallel with its length.

They are not in the form of any particular design. A peculiarity in the construction of this mound was a double layer of limestone flags, separated by a few inches of burnt earth, which was encountered about half way down from the apex, and covering the remains of the original interment at the base. In the vicinity of these mounds, which were situated on a ridge about 500 yards back from the Red River, he found an old camp site, with quantities of "Kitchen-midden," including fragments of pottery, shell and stone heads, partially worked and completely formed arrow heads and scrapers, hammering stones, two stone axes, roughly formed, beaver, buffalo and deer bones, etc. The markings on the pottery were no doubt made by indentation, though in cases the finger-nail marks are discernible. The designs consist of combinations of lines and dots or holes. On comparing the design on one rim fragment taken from the river bank with that on a complete cup taken from a mound within the limits of the city of St Paul, Minnesota, I find that they are almost alike. The materials used in making the pottery were evidently clay, with pulverised shells and decomposed granite, all of which are to be had in abundance in the immediate neighbourhood. A ridge of limestone tapped with drift gravel and boulders here crosses the Red River and supplied raw material for the manufacture of flint implements and weapons. I am unable to learn that any article of European manufacture has been found in the Manitoba mounds. What is strange also is the fact that no article of copper has come to light from these mounds, though, at a distance of 200 miles eastward, on the Rainy River, where a number of mounds have been opened, a majority of the articles found are of that metal, which was probably obtained at Lake Superior, as a direct canoe route from Rainy River leads to opposite Isle Royale where many ancient copper mines have been found. Over 20 mounds have been identified on the banks of the Rainy River, part of them being in the territory of the United States, the river here forming the boundary line between it and Canada. One mound situated at the junction of a southern feeder with the Rainy River is fully 45 feet in height and most likely the largest of the whole mound system. It has been dug into in many places and the large number of relics taken out and carried away and scattered from one end of the country to the other. One mound at the head of Rainy River contained the remains of a structure of logs, about 8 feet square, which showed the action of fire. It had evidently surrounded and covered the original interments. A number of relics were found in this tumulus. But few of the mounds in this region remain intact, and steps should be taken immediately to preserve the small number left. The builders of these mounds were doubtless of a different branch from those of the Red River, and communicated directly with the Mississippi by the streams and lakes which practically form a through canoe route. The country to the direct north of the Rainy River has not been explored, so far as I can learn for mound remains, but the broken character of this section, which is of Laurentian formation, rather inclines me to imagine that none will be found there, because the rule is to find the mounds in the most fertile agricultural districts. Lead, mica, asbestos, gold and silver are found in the rocks of the Lake of the Woods, close at hand to the Rainy River, but there is no record of any of these minerals having been unearthed from the mounds. It is true one piece of ore taken from the hand of a skeleton in the Great Mound has been identified by Dr. Bryce as arsenical iron. Many mounds are situated on the streams flowing from the west into the Red and Assiniboine Rivers, and during this week I have received a communication from a friend who has spent some time in the District of Alberta, in which he stated that "the country is rich in mounds." When it is known that numbers of mounds have been located on the Upper Missouri it is not surprising that they also appear on the streams from the Rockies to the north. Thorough exploration is required to give an exact idea of the geographical areas covered by the northern branches of the mound systems of both the Mississippi and Missouri. That the systems of the Red River and Missouri approach each other closely I proved during the past summer. Groups of the first extend to the headwaters of the Pembina and Souris rivers, which are comparatively close to the Missouri and on the old main trail between the Red River and Missouri, which was the route taken by war parties of the Crees, Assiniboines, and Ojibways from the neighbourhood of Lake Winnipeg, and in more modern times by the Red River half-breed buffalo hunters. Living about Lake Winnipeg, the Mound Builders must have known of the Nelson River, leading directly to tide water in Hudson's Bay, and of the great Saskatchewan flowing from the Rocky Mountains with its northern feeders interlocking with those of the Mackenzie. There is much food for thought and investigation in all this, and the subject is well worthy of consideration as serving to throw light on important points connected with the peopling of North America—whether the Mound Builders were Indians or a different race of men. The remains of the Mound Builders vary in character and structure in different recognized geographical areas, as, for instance, the pyramidal mounds of the Southern States, the embankments of the Ohio, the stone graves of Tennessee, and the effigies of Wisconsin. It may be taken for granted that even if one race of people with customs in the main identical, climatic influences alone would modify and alter the habits of the Builders. The presence of manufactured seashells in the mounds of Manitoba, which probably came from Southern California or the Gulf of Mexico, will give a clue to the range of the trade. Not only have specimens of the *Busycon perversum* been taken from the mounds on the Red River, but several shells of the *Natica* and *Marginella* appeared in a mound on the Rainy River, a distance of fully 1,500 miles from their native water. The Manitoba Mound Builders probably had some other medium of exchange than copper, which does not seem to have been used then (judging from its total absence so far as now known), and it is extremely probable that the fine fur of the north was sent south to regions which, though possessing a milder climate, were subject to variations of temperature that necessitated the use of warm clothing at certain seasons. In short, fur was no doubt the article exchanged for the sea shells of the south. While agriculture may have been engaged in, and the presence of mounds in the most fertile districts suggests that it was, no traces of stone spades, or "furrowed patches," such as have been discovered further south, have yet come to light in or near the mounds opened, of which record has been filed. Like the Mandous, the Builders may have used the shoulder-blade of the buffalo as a spade. In a short paper of this kind it is impossible to enter into many details, and I have been compelled to omit many interesting data which have been secured by field work in the North-West.

Mr. J. H. Hunter enquired whether there was any theory in regard to the age of the mounds.

Mr. Bell did not like to offer any. It was very difficult to tell their age. Most mound-diggers have refused to give any date. Much depends on the nature of the soil adjoining them. In the case of trees, the number of rings was not a certain guide. In regard to the Manitoba mounds, there is sufficient historical evidence that at least 200 years have passed since their erection.

Mr. Browning described some graves he had seen in the North-West, and enquired whether there was any theory as to the mode of burial among the Indians.

Mr. Bell replied that all the northern tribes adopted the scaffold mode of burial. Since the arrival of the whites they have gradually adopted their mode of burial.

Mr. Hunter enquired whether there were any legends connected with them.

Mr. Bell—None whatever.

The President presented the thanks of the meeting to Mr. Bell for his valuable and interesting paper.

THIRTEENTH MEETING.

The Thirteenth Meeting was held on 27th February, 1886, the President in the chair.

The following list of Donations and Exchanges was read:

1. Monthly Weather Review, Dominion of Canada, Jan. 1886.
2. Electrical Review, Feb, 20th, '86.
3. Annals of Mathematics, University of Virginia, Vol. II., No. 1, Sept. '85.
4. Journal of the Chemical Society, New York, Vol. VII., No. 10, Dec. '85.
5. The American Naturalist, March, '86.
6. Journal of the Anthropological Institute of Great Britain and Ireland, Vol. 15, No. 3.
7. Proceedings of the Royal Society, Vol. XXXIX., No. 240.
8. The Chemical News, Feb. 12, '86.
9. Cosmos, 8 Février, '86.
10. Rendiconti del Circolo Matematico di Palermo, Marzo 1884, Marzo 1885.
11. Jahresbericht der Geographischen Gesellschaft von Bern, 1884, 1885.
12. Bulletin de la Société Impériale des Naturalistes de Moscou, Tome LXI. Nos. 1 et 2, 1885.
13. Electricité, 6 Février, '86.

14. Archivio di Letteratura Biblica ed Orientale, Anno VIII., No. 1, Gennaio 1886.
15. Mittheilungen der Anthropologischen Gesellschaft in Wien, XV. Band, II. Heft.
16. Annales de l'École Polytechnique de Delft, 3me et 4me Livraisons.
17. Mémoires de la Société Nationale des Antiquaires de France, Cinquième Serie, Tome *5me*, Paris, 1884.
18. Wochenschrift des österreichischen Ingenieur-und Architekten, Vereines XV., No. 6. 5 Februar '86.

Total 19.

The following were elected members: Sydney B. Sykes, Robert A. Smith and Percy A. Bath.

A sale of Periodicals from the Reading Room was then held.

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PROCEEDINGS

OF

THE CANADIAN INSTITUTE,

SESSION 1886-'87.

FOURTEENTH MEETING.

Fourteenth Meeting, 6th March, 1886, the President in the Chair.

The following list of donations and exchanges was read :

1. The Canadian Practitioner, March, 1886.
2. The Spectator, December 5, 12, 19, 26, 1885, and January 9, 1886.
3. Electrical Review, February 27, 1886.
4. Pennsylvanian Magazine of History and Biography, Vol. IX., No. 4, January, 1886.
5. Transactions of the American Society of Civil Engineers, December, 1885.
6. Bulletins of the United States Geological Survey, Nos. 15—23.
7. American Journal of Science, March, 1886.
8. Proceedings of the Academy of Natural Sciences of Philadelphia, Part III, August to December, 1885.
8. Proceedings of the United States Naval Institute, Annapolis, Md., Vol. XII., No. 1.
10. Magazine of American History, March, 1886.
11. The Electrician and Electrical Engineer, March, 1886.
12. The Chemical News, February 19, 1886.
13. Scottish Geographical Magazine, Title Page and Contents, Vol. I., 1885.
14. Journal of the Royal Microscopical Society, Series II, Vol. V., Part 6, December, 1885 ; Series II., Vol. VI., Part 1, February, 1886.
15. Illustrated Journal of Patented Inventions, No. 59, February 19, 1886.
16. Monthly Notices of the Royal Astronomical Society, Vol. XLVII., No. 3, January, 1886.
17. Transactions of the Institution of Engineers and Shipbuilders of Scotland, 29th Session, 1885-86.
18. Correspondenz-Blatt der deutschen Gesellschaft für Anthropologie, Ethnologie und Urgeschichte, Januar und Februar, 1886.
19. Electricité, 13 Février, 1886.
20. Cosmos, 15 Février, 1886.

21. Nordisk Tidskrift for Filologie, Vol. VII., Hæfte I, II, Copenhagen.
22. Tijdschrift voor Nijverheid e Landbouw in Nederlandsch Indië, Deel XXXI, Aflevering VI, Batavia, 1885; Billiton Opstetten door P. H. Vander Kemp III.
23. Monatliche Mittheilungen des naturwissenschaftlichen Vereines des Regierungsbezirks Frankfurt-a-O., 3 Jahrgang, Nos. 9, 10.
24. Wochenschrift des österreichischen Ingénieur und Architekten Vereines, Wien, 12 Februar, 1886.
25. Cronica Cientifica, Barcelona, Año IX, Num. 196. Feb. 10, 1886.
26. Compte Rendu de la Société de Géographie, Paris, No. 4, pp. 113-150.
27. Journal des Sociétés Scientifiques No. 7, Title Page and Contents for 1885.
28. Verhandlungen der Gesellschaft für Erdkunde zu Berlin, Band XIII, No. 1.
29. Real Academia de Ciencias Morales y Politicas, Madrid, Resumen de sus Actos y Discursos 1862, 1866, 1871, 1876, 1883, 1884, 1885, Estatutos y Reglamentos de la Academia, Anuario de 1886.

Total 57.

Mr. J. B. Williams read a paper on "The Destruction of Wild Animals and the Means that should be Taken for Their Preservation," of which the following is an abridgment:

If we walk through the forest on some bright spring morning, all nature seems to rejoice around us. Squirrels are sporting, birds are singing, insects flitting in every direction.

It is difficult then to realize, or remember, what a struggle for existence all these creatures pass through at some period or other of their life. Every creature naturally increases at so high a rate, that if multitudes were not destroyed, the earth would soon be covered by the progeny of a single pair. This applies to the more slowly breeding, as well as to those that increase annually by the hundred or the thousand.

What are the means employed by nature to keep in check this too superabundant life?

To eat and *to be eaten* is the end and object for which multitudes of creatures seem to exist. Almost every creature serves as food for some other creature, and the struggle for existence causes a continual destruction of old forms by new and more highly developed races.

The causes which determine the survival and distribution of each species are very often complex and unknown to us.

Climate, the supply of food, and, in recent times, the influence of the human race, are some of the causes which have determined the existence and the range of our present species.

Just as the advent in America of a superior race of men has driven the Indians from their ancient power and position, so it has been with the races of animals; the new and more highly organized forms have supplanted, and often destroyed, prëexisting races.

The opossum is, in America, the sole surviving representative of the marsupial animals, which once probably were spread as the leading race over the whole world.

They still occupy a supreme position in Australia, because they have been protected from severe competition with higher forms by separation from the mainland within recent geological times.

Instances occur in several other islands of survival by protection, of birds and reptiles representing families, now almost extinct, but which once were the predominant races.

Thus nature has preserved some records and examples of her past work. Shall we not act wisely, if we also try to preserve for the benefit and instruction of future generations some of those creatures which will, before long, be entirely destroyed unless special means are taken for their protection?

Within recent times the extinction of the Moa in New Zealand and of the Dodo in the Mauritius has been brought about largely by human destructiveness.

The Apteryx still survives in the unsettled portions of New Zealand, but it will soon disappear unless special means are taken to protect it from advancing civilization.

In North America during the last thirty years two birds have become extinct; viz., the great Auk, whose principal breeding places were the banks of Newfoundland and Labrador; and the Pied Duck, a bird nearly related to the Eider Duck; one of the last specimens was killed in Halifax harbour in 1852.

A startling decrease in the numbers of some of our most beautiful birds has been brought about, of late years, by the unceasing war raged against them in order to supply the demands of fashion.

If we turn now to the large mammals, we find the Moose and the Buffalo, or Bison, are being gradually driven from their ancient haunts, and will probably be extinct in a few years' time.

The Buffalo is now nearly extinct in the States. Where thousands used to be met with, it is a rare thing to meet with one or two hundred. The cause has been the relentless and indiscriminate slaughter of whole herds.

The results of the destruction of the Buffalo in Canada were predicted with remarkable accuracy in 1879, when a proposal was laid before the Dominion Parliament by Dr. Schultz to prevent their destruction during the winter months. A report then presented stated that, unless the Buffalo were protected, in ten years at the very furthest, the whole number of Indians in the Northwest, who then relied on those animals for subsistence, would have to be fed and maintained, principally at the expense of the Dominion Government; and that, compelled by hunger, they would be driven to commit outrages which would result in an Indian war.

During that year—1877—about 160,000 Buffalos were killed in Canada alone, but no effective measures were taken to stay the slaughter.

The Moose once ranged as far south as Ohio, now it is almost driven out of the Eastern States, but is still common in unsettled portions of New Brunswick and Nova Scotia. Its range in Canada extends north as far as the McKenzie River, and west to the Rocky Mountains.

It would be a great pity for this magnificent creature to disappear, as it certainly must do if the forests are all destroyed. Animals as large have become extinct in Europe since the historic period. The great Wild Ox, described by Julius Cæsar in his Commentaries, no longer roams in the Hercynian Forest. The white cattle preserved by Lord Tankerville at Chillingham are the last remnants of a British wild ox.

The European Bison, or Aurochs, is now only found in the forests of Lithuania, and some parts of the Caucasus. Those in Lithuania are carefully protected by the Emperor of Russia.

The European Moose, or Elk, was at one time numerous in most parts of Sweden and Norway, but owing to increased population and other causes, it is now only met with in particular districts.

Beavers were found in England and Scotland in the 12th century, and remains of their dams still exist in some parts of Wales.

A certain amount of protection is afforded to some of our wild animals by the existing game laws, but as the country becomes settled something more will be necessary, and considerable areas of prairie and forest must be maintained in their native wildness and grandeur, if future generations are to gaze upon the Moose and Buffalo.

Such reservations could be easily created now. If left for another generation they could only be formed at very great expense.

Our neighbours across the line have set a good example in this respect. The Yellowstone National Park or Reservation in the United States was set apart by Act of Congress in 1872. It is under the control of the Secretary of the Interior, who is authorized by the Act "to provide for the preservation from injury or spoliation of all timber, mineral deposits, natural curiosities or wonders, within the said Park; and against the wanton destruction of the fish and game found within the said Park, and against their capture or destruction for the purposes of merchandise or profit."

The Park lies between Wyoming and Montana Territories. Its length north and south is sixty-one miles, and its breadth fifty-three miles, its total area being a little over 3,000 square miles. The district comprised within its boundaries is 6,000 feet above the sea level and the greater portion of the land is covered with magnificent pine forests. A report recently presented to Congress recommends that *all* shooting be prohibited within the Park, and that visitors to it shall not even be allowed to carry firearms.

It would, perhaps, be better to form in Canada several such Reservations of moderate size, rather than one very large one; for there is another object in making these reservations besides that of protecting wild animals—the rainfall of a country or district is considerably affected by the destruction of its forests.

The gradual diminution of forests in the Adirondack Mountains has seriously affected the water supply of New York State. The volume of some of the rivers has decreased from thirty to fifty per cent. within the memory of man.

The Yellowstone Park is a watershed whence several large rivers have their source, hence one reason for its selection as a permanent forest.

Look at a map of Canada and you will find several districts about fifty miles square, from each of which a number of important rivers have their source.

There is one such in the northern part of New Brunswick; one in Ontario about one hundred miles northwest of Lake Nipissing; one near the Kicking Horse Pass in the Rocky Mountains.

These would seem to be appropriate spots for forest reservations.

It may not be possible to carry out all that is suggested here, but something may be done, I trust, if the subject can be brought prominently before the public and the Government.

Mr. Marling thought a representation should be made to the Government by the Institute on the subject of providing a suitable reservation.

Mr. Bain directed attention to the tract known as the Barren Grounds as affording a suitable place for a good natural reservation.

Mr. Rouse thought that such a reservation should be easy of access.

The President was strongly in sympathy with the views expressed by Mr. Williams, and agreed on the necessity of a reservation. He was in favour of additional security being provided by law, especially in the case of birds. He did not know the exact reading of the law, but thought it should not only prohibit the killing of the animals in certain seasons, but also having them in possession or exposing them for sale. He had seen barrels of brook-trout exposed for sale by fishmongers on Yonge street during the protected time of the year. The delicate flavour of the trout was destroyed, and they were of no more value than any coarse fish. This exposure for sale could be prevented in the centres of population. Thus the law should be strictly enforced, and examples made of all offenders In the case of birds, they should not be allowed to be killed, nor exposed for sale, nor the feathers worn on the person. This would protect the birds effectually. He was in favour of the Institute bringing the matter before the Government and asking for the additional restrictions he mentioned.

Mr. Purvis suggested that the matter be referred to a Committee.

Mr. Pursey and Mr. Noble explained the views of the Natural History Society on the subject.

On motion of Mr. Livingston, seconded by Mr. Browning, it was resolved that the President be asked to appoint a Committee to co-operate with the Committee appointed by the Natural History Society in carrying out the views set forth in Mr. Williams' paper.

FIFTEENTH MEETING.

Fifteenth Meeting, 13th March, 1886, the Second Vice-President in the Chair.

The following list of donations and exchanges was read :

1. Le Naturaliste Canadien, Mars, 1886.
2. The Canadian Entomologist, Vol. XVIII, No. 1.
3. Journal of the Franklin Institute for March, 1886.
4. Electric Review, March 6, 1886.
5. Science, Vol. VII., Nos. 160 and 161.
6. West American Scientist, Vol. II., No. 1.
7. Journal of the New York Microscopical Society, Vol. I., No. 9.
8. Magazine of American History for February, 1886.
9. " Huguenots and the Edict of Nantes," from the Rhode Island Historical Society.
10. Transactions and Proceedings of the Technical Society of the Pacific Coast, Vol. II., No. 14 and Vol. III., No. 1.
11. Transactions of the American Institute Mining Engineers, Vols. I.-IX., and Vols. XI.-XIII., with Index Vol. I.-X., May, 1871 to June, 1886.
12. Imperial Federation, March 1, 1886.
13. The Chemical News, February 26th, 1886.
14. Transactions of the Cambridge Philosophical Society, Vol. III., Part I, 1886.
15. Wochenschrift des oesterreichischen Ingénieur und Architekten Vereines, 19 Februar, 1886.
16. Electricité, 20 Février, 1886.
17. Cosmos, 22 Février, 1886.
18. Boletin de la Real Academia de la Historia, Vol. VIII., No. 1, Madrid.
19. Mémoires et Comptes Rendus des Travaux de la Société des Ingénieurs Civils, Octobre, 1885.
20. Gazetta Chimica Italiana, Anno XV., Fas. 10.

Total 35.

Rev. Th. Laboureau of Penetanguishene was elected a member. Mr. J. A. Livingston read a paper on " The Desirability of giving Currency to all Convertible Securities."

SIXTEENTH MEETING.

Sixteenth Meeting, 20th March, the President in the Chair. The following list of donations and exchanges was read :

1. Canadian Entomologist, Vol. XVIII., No. 2.
2. Monthly Weather Review, Dominion of Canada, February, 1886.
3. Annual Report of the Library Commissioners and Librarian for 1885. Halifax, N.S.
4. Second Annual Address before the Oneida Historical Society of Utica, by William Tracy.
5. Science, Vol. VII., No. 162.
6. The Electrical Review, March 13th, and 20th, 1886.
7. Annals of Mathematics, University of Virginia, Vol. II., No. 2.
8. The Old Lodge, from the Georgia Historical Society.
9. Report of Proceedings of the Eighteenth Annual Convention of the American Railway Master Mechanics' Association, June 16th, 17th, 18th, 1886, presented by G. Davies Barnett, Esq.
10. Chemical News, March 5th, 1886.
11. Proceedings of the Royal Geographical Society, Vol. VII., No. 3, March, 1886.
12. The Midland Naturalist, No. 99, March 1886.
13 Trübner's American, European and Oriental Literary Record, Nos. 219, 220.
14. Quaritch's Catalogue, No. 365.
15. Proceedings of the Literary and Philosophical Society of Liverpool, Vol. XXXVIII., 1883-84.
16. Wochenschrift des österreichischen Ingenieur und Architekten-Vereines, Wien, 16 Februar.
17. Annalen des K. K. naturhistorischen Hofmuseums, Jahresbericht für 1885. Band V., No. 1.
18. Electricité, 27 Février, 1886.
19. Cosmos, 1 Mars, 1886.
20. Boletin de la Sociedad Geografica de Madrid, Tome XX., Numero 1.
21. Bullettino della Sezione Fiorentina della Societá Africana d'Italia. Volume II., Fascicolo 1.
22. Compte Rendu de la Société de Géographie. No. 5, pp. 153, 176. Paris, 1886.
23. Journal des Sociétés Scientifiques, 3 Mars, 1886.
24. Jahrbücher des Nassauischen Vereines für Naturkunde, Jahrgang 38, Wiesbaden.
25. Allgemeine Bibliographie der Staats und Rechtswissenschaften XIX. Jahrgang No. 1, 2, 1886.
26. Bullettino di Bibliografia e di Storia delle Scienze Matematiche e Fisiche Tomo XXIII, Maggio 1885. Roma.

Total 28.

Mr. R. E. Kingsford, M.A., read a paper on "The Campaign of 1815."

The Rebellion of the French nation against Louis XVI. was the protest of humanity against oppression. The French, that lively, courageous and industrious race, deserve the world's thanks for their esperate resolution to inaugurate a new system. Their thoroughess in carrying out the resolve brought upon them the enmity of lmost all other nations, but those very nations profit this day by he Revolution, to punish which they invaded France. Even the nsular English, then politically a century in advance of the Contient, found that they had much to learn. An impulse was given to spirations for freedom which was communicated to each of the ontinental nations in succession, and this impulse, though impeded om time to time, has never ceased in its action. But just as, in e case of individuals, men suffer in their own persons the conquences of originality, so the French nation bitterly paid for its nerous self-sacrifice on the altar of Freedom. A sacred cause was efiled; enthusiasm was replaced by fanaticism; fanaticism gave way fter a struggle to charlatanism; charlatanism supported itself by murer. The end was chaos. Out of chaos sprang Napoleon. A man of e sword, he smote with the sword, and he crushed the vermin who, ring to crawl on the statue of liberty, had stained it with their th. But the statue itself he overturned, and he placed himself on e pedestal. From that eminence he was in turn struck down, but e long held the position by virtue of extraordinary genius, courage d energy. We shall see him make a supreme effort to recover himlf, almost succeed, then sink, baffled and exhausted, into a Slough f Despond, from which he was destined never to emerge.

We propose to give a succinct account of the military operations of e 15th, 16th, 17th and 18th of June, 1815. A careful examinaon of the authorities has led us to the opinion that the popular elief of Englishmen and men of English descent with regard to this mpaign requires revision, and that there are salient features which ave been ignored by most English writers.

The general English idea is that "The Duke" drubbed the French ell, and that he never was in serious danger.

The Prussians think, on the other hand, that the English would ever have beaten the French but for their help, and that they are, equally with the English, entitled to the credit of victory, perhaps more so.

The French, again, believe that their idol would have annihilated both English and Prussians had there not been treason. They know that the Prussians were defeated and the English surprised, and why they themselves were ultimately beaten they have never understood.

Examination of the facts should inform us which of the two first opinions is correct and give us an explanation for the third. This examination we propose to make briefly, but fairly and dispassionately.

The story we have to tell may be called the "Drama of Waterloo." It consists of a Prologue and Four Acts. We propose to narrate it in that manner.

PROLOGUE.

Napoleon left Elba on the 26th February, 1815. He landed at Cannes on the 1st March. He arrived at Fontainebleau on the 20th March. That is, in three weeks he was master of France. The first prominent man who joined him was General Labedoyère. We shall meet his name again.

The army and the Marshals declared for the Emperor on the 22nd of March.

But the Bourbons had been in power since the preceding May. A few of the Marshals and a portion of the superior officers remained true to them. In the interval, also, they had broken up the old Napoleonic organization. They had replaced the Tricouleur by the White Lilies. They had changed the designations of the various regiments, studious in every thing, Mrs. Partingtons as they were, to use their feeble broom against the tide of modern feeling. But there were with the colours on the 1st April 223,972 men, 155,000 of whom were ready to take the field.

The evidence as to the condition of these men seems to establish that they were well uniformed and armed. Napoleon claimed that they were not so, but it seems that his statements were incorrect on this point.

Here is afforded the opportunity of presenting the real obstacle in the way of forming a fair judgment of the occurrences we are about to relate.

Napoleon published two versions of the campaign of 1815: the first, by General Gourgaud, in 1818; the second in 1820, as *Mémoires* *pour servir à l'histoire de France en 1815*, subsequently re-published in 1830 as Volume IX. of the Memoirs dictated at St. Helena. These volumes, according to certain French authorities, are full of mistakes, misrepresentations and inexact statements. For some years, however, they passed unquestioned. In 1840 the Duke of Elchingen, second son of Marshal Ney, with the view of restoring his father's memory, which he deemed unjustly assailed by Napoleon, gave the first shock to their authority by publishing a collection of the orders and letters of the Emperor to the Marshal, and also the result of enquiries made by himself among officers then surviving as to what actually happened. Other memoirs, such as those of Grouchy and Gérard, were also published. Between 1839 and 1842 appeared Alison's Europe. Siborne's account of the Waterloo Campaign, which, although trustworthy, contains too much fulsome eulogy of the "Great Duke," was published in 1841. The German, or Prussian, view of the matter, as given by Von Damitz and Von Clausewitz, had been published in 1837 and 1835. Thus conflicting materials accumulated. At last, in 1857, there appeared the "*Histoire de la Campagne de* 1815," by Lieut.-Colonel Charras, which, although not as commonly known to English readers as it ought to be, must ever be consulted as an elaborately minute account of the campaign. It must be read with caution, as it is very unfair to Napoleon in many points, while its author claims an eager desire to do him justice. A critical examination will lead to the conviction that the desire, if it really existed, was not carried out. M. Edgar Quinet's "*Histoire de la Campagne de 1815*" was published in 1862. He follows in Charras' footsteps. Thiers also gives a version of the events, which should be read as a corrective of Charras. If Napoleon threw the blame of the disaster upon others, a certain school of French writers, of whom Charras and Quinet are types, have not been slack in retorting on him. He is made responsible, as far as possible, for the unfortunate issue of the campaign, and in his shortcomings is found some solace to wounded French pride. In using both Charras and Quinet this fact must be borne in mind, and even-handed justice will be forced to modify their conclusions on many points in Napoleon's favour.

The divergence comes up first with reference to Napoleon's actions after he had landed in France. The anti-Napoleonic school minimize in every way what was done, but the general impression on this subject is that the Emperor displayed wonderful genius and energy.

Siborne says:—"Never, perhaps, in the whole course of the extra-"ordinary career of that extraordinary man did the powerful energies "of his comprehensive mind shine forth with greater brilliancy and "effect than in his truly wonderful and incredibly rapid development "of the national resources of France on this momentous occasion." We cannot here enumerate all that Napoleon effected between the time of his landing at Cannes in March and his taking the field in June. A discussion of his political measures during this time is foreign to our purpose.

It may be pointed out that the French complain that Napoleon did not lay before them as a nation the peril in which they stood. In May 800,000 foreign troops were on their borders. But Napoleon deceived the people by constant assurances of peace. His war measures, they urge, were not taken with the determination necessary under the circumstances. On the 25th March the Congress of Vienna had formally declared a united war of Great Britain, Russia, Prussia and Austria against Napoleon. He knew of this declaration, the country should have known of it too. But Napoleon felt his personal danger. His only line of policy in his own interest was that of not alarming the French too soon, or they would have perceived the effects of their sudden revolution in his favour and would have risen against him. He therefore declared no general levy of the National Guard. But the fact remains, that while Napoleon on the first of March was an exile, on the first of June he had a thoroughly equipped regular army of 200,000 men. He had a reserve of another 200,000. By the 15th June he would have had the conscription of 1815, producing 77,500 more, besides another hundred battalions of National Guard, or 70,000 more; in all, 555,000 soldiers. When in addition to these figures we take into consideration the immense mass of material, cannon, equipment for horse and man, provided by Napoleon during this time, the fortresses he garrisoned, besides the thinking out and preparing for the campaign with the necessary movements of troops, whatever some French writers may say, the world will not withhold from him its admiration. It should be remembered also that nothing has been said of his complete reorganization of the civil administration in all its aspects, social, financial, and political; nor of his negotiations with foreign states, alone enough to tax the greatest powers. The man who accomplished such results in so short a time now threw down the gauntlet to Europe.

ACT I.

SCENE :—CHARLEROI.

Time :—15th June, 1815.

Nothing marks more clearly the immense progress the world has made since 1815, than the advance in the means of communicating intelligence. To-day, if Russia masses her Cossacks at a point on the Indian frontier, all England knows it the same day, and explanations are demanded forthwith.

In June, 1815, Napoleon threw 130,000 men on the Flemish frontier, and neither Wellington nor Blücher knew of it until the blow struck them. Of his 200,000 men, Napoleon could at this point only avail himself of 130,000. In Alsace, Savoy, the Pyrenees, and La Vendée were 52,800 more; the remainder of the 200,000 were in garrison at Paris, Lyons, and other places. It is with the fortune of these 130,000 men that we have to deal. Napoleon, having decided to try the issue of war in Belgium, directed his efforts towards masking the movements of his troops. He had divided his army into six corps, which, on the 1st June, were at Valenciennes, Avesnes, Rocroi, Metz, and Laon. The Guard was at Compiègne. The total strength of the army was 128,088 men, with 344 guns. All this mass was quietly moved in such a manner that on the 14th of June the whole stood in front of Charleroi, ready to strike, the emperor being personally in command. Opposed, were the Anglo-allied and Prussian armies.

The Duke of Wellington had at his disposal 105,000 men and 186 guns.

Blücher had about 120,000 men and 312 guns: in other words, 130,000 French and 344 guns, against 225,000 allies and 498 guns: Napoleon against Blücher and Wellington. The Anglo-allied and Prussian armies lay side by side. The highway between Charleroi and Brussels was the dividing line. It was the English left, the Prussian right, except close to Charleroi, where the Prussians overlapped. From it Wellington's forces stretched to the sea. From it Blücher's extended to Liége, considerably over one hundred miles from the sea. Wellington had named Enghien or Nivelles as his point of concentration, as he might be attacked on his right or left centre. Blücher had chosen Sombref and Namur for the same purpose. It will be seen that, while Wellington or Blücher could each concentrate his own troops on their own respective centre within a comparatively short time, yet, if they were attacked on either flank it would take a much longer time to collect them. The readiest mode of attacking Wellington from France was on his right, that is, by way of Mons and Ath, as will be seen by looking at the map of France and Belgium. He expected to be so attacked. His secret orders of the 30th April, 1815, are a proof of this statement. Having premised that he had received intelligence that Napoleon was about to visit the northern frontier, he proceeds :—

"In this case the enemy's line of attack will be either between "the Lys and the Scheldt, or between the Sambre and Scheldt, or "by both lines."

It was neither. It was between the Sambre and the Meuse, and on his extreme left, not on his right or left centre. But Wellington's mind was pre-occupied with his own idea, and even when the attack came on his extreme left he gave orders for concentration on Nivelles, which, fortunately for his reputation, were disobeyed. Had they been followed, Napoleon's left wing would probably have been in Brussels on the 16th of June.

Napoleon struck the allies precisely where they were weak, just at the point where it took them longest to concentrate. His strategy deserved to succeed, and the impartial student, however much he may find it necessary to blame Napoleon in his career, can only come to one conclusion on this master stroke. Unquestionably Napoleon did surprise Wellington and Blücher, his plan was well laid, ably executed, and only miscarried from a series of strange accidents, which, as one reads of them, seem as if they were the result of supernatural interference.

The campaign being one of attack, it will be best understood by following the attacking force. The French army, being collected in three divisions, advanced during the night of the 14th in three columns, the left from Solre-sur-Sambre (see map) by Thuin upon Marchiennes; the centre from Beaumont by Ham-sur-Heure upon Charleroi: and the right from Philippeville (not on map) by Gerpines upon Châtelet.

Now happened the first check. General De Bourmont, a General of Division, with some of his staff, deserted. The effect was most depressing. The confidence of the soldiers in their officers, of the officers in each other, of Napoleon in his lieutenants, was shaken. It is difficult to speak calmly of such an act. The strangest part of the matter is that this same De Bourmont, being honored by the Bourbons, became Minister of War under Charles X., organized the expedition which resulted in the capture of Algiers, and was made a Marshal of France. He died in 1846, having passed his latter days in obscurity, owing to the fall of Charles X. But his reception by sturdy old Blücher must have shown him what honest men thought of him. That stout old hero turned on his heel when he was presented, and when attention was called to the white cockade De Bourmont had mounted, all he said was: *Einerlei was das Volk für ein Zeichen aufsteckt. Hundsfott bleibt Hundsfott.* "What has the "cockade to do with it? The man is a scoundrel." Quinet says of this event: "After half a century, in which we have honoured and "crowned every man who has succeeded, this desertion is perhaps "the only one which has not found apologists among us." How different was the feeling of Berthier! He refused to join Napoleon, and retired to his palace at Bamberg. But when he heard the drums of the Russian troops on their march to invade France, in an agony of shame and remorse he threw himself from one of the palace windows and was taken up dead.

But the advance continued. The first enemy met was by the left, which struck part of the Prussian division of Pirch II. (so called to distinguish him from another general of the same name, who is called Pirch I.), belonging to Ziethen's corps, one of the four of Blücher's army. News of the French advance had by this time been conveyed to Wellington and Blücher. The latter at ten o'clock on the night of the 14th, had ordered Ziethen to wait the attack and slowly retire towards Fleurus. The other three corps of the Prussian army were ordered to move. Bülow from Liége to Hannut, Pirch I. from Namur to Sombref, Thielmann from Ciney* to Namur.

As the French divisions successively came up on the left and centre they were pushed forward, driving the Prussians back, but the latter stubbornly held every position, both on the Brussels and on the Namur roads. The French had to fight their way. The Pirch II. division was gaining time for the other divisions of Ziethen's corps to concentrate at Fleurus. Charleroi was taken by one o'clock, and the French passed through, some towards Gosselies, others towards Gilly. At five o'clock, Marshal Ney came up to take command on the Brussels road. On the 11th he had been in Paris. He had received a message from Napoleon: "If Ney wishes to take part in the first battle, let him be on the 13th at Avesnes (not on map), which will be my head-quarters." He had started on the 13th, had arrived in Beaumont on the 14th, was detained by want of a horse, had bought a couple from Marshal Mortier on the 15th, and found Napoleon at about half-past four. Napoleon welcomed him, put him in command of the 1st and 2nd corps, D'Erlon's and Reilles' (44,300 men), and some cavalry, and concluded his instructions by ordering him to advance and *drive the enemy*.

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* Liége, Hannut and Ciney are east of the limits of the map.

From this point commences a division of Napoleon's army, part under Ney on the left along the Brussels road, the other part under the emperor along the Namur road. Ney ordered his men to push on. The Prussians, who were on the west of the Brussels road, had by this time all crossed it, making for Fleurus, and the way was clear to Frasne. There the advance struck the extreme left of the Anglo-allied army. It was now half-past six. The allied troops at Frasne were part of the first corps of Wellington's army, and belonged to the 2nd Dutch-Belgian division, 7,500 strong, under the command of General Perponcher. The battalion actually in position, about 4,000 strong, was under the command of Prince Bernhard of Saxe-Weimar. It held its ground firmly against the attacks of such troops as Ney brought up. The latter thought it better not to run any risk, and therefore resolved not to attempt anything more, but to hold Frasne and await orders. Frasne is between five and six miles north of Charleroi; Solre-sur-Sambre fifteen miles from Charleroi. The left had, therefore, advanced some twenty miles. They had started at three in the morning, commenced to fight at four, crossed the Sambre at ten, pushed on north to near Gosselies, and there waited for orders, which they received about three o'clock, that is, they had three or four hours rest. They then had advanced to Frasne, where, as above stated, Ney took command about five. It is not easy to understand why he was now so cautious. He had the cavalry division of Piré in hand, and Bachelus' infantry corps in support, and some artillery. If he had pressed Prince Bernhard, who had only four thousand men, he could probably have occupied Quatre Bras, instead of Frasne, that night. If he had done so, he would have commanded the line of communication between the English and Prussian armies. The road from Namur to Nivelles crosses the Brussels road at Quatre Bras. It was, therefore, of the greatest consequence to Napoleon to take it, and to the allies to hold it. A glance at the map will show that such was the case. If, then, Ney had seized Quatre Bras on the evening of the 15th, Napoleon's tactics would have been perfectly successful. His not doing so was the first failure in the campaign. Charras says Ney was right in not attempting to attack Quatre Bras. The reasons he gives are cogent, but the fact seems to be that Ney was imposed upon by the strong front shown by Prince Bernhard, and could, if he had pressed on, have carried Quatre Bras with ease.

On the centre, owing to a mistake in the transmission of orders, Vandamme's Division, instead of marching at three in the morning, did not march until seven o'clock. The Young Guard took their place in the column. But the result of the delay was that the advance guard of the centre, which appeared before Charleroi about eight o'clock, was not supported until twelve. The Young Guard then came up, and by their assistance Pajol, who led the advance, entered Charleroi, passed through and pressed the Prussians, until the latter stood firm at Fleurus. Grouchy, who subsequently came up, halted with Napoleon's approval, and the latter returned to Charleroi at eight o'clock, worn out with fatigue. The right, having started later, reached Châtelet at three o'clock, and remained in front of that place. Such were the results of the first day's operations. The Sambre was crossed, Charleroi taken, the French centre and right lay on the Namur road in front of Fleurus. Was the day successful or not? The answer to this question depends on how far the allies had made use of the time in concentrating their forces. We have seen what Ziethen did. He concentrated his corps at Fleurus, where he stood prepared to dispute the passage.

We have seen that orders were given by Blücher on the night of the 14th to his army to close up.

By midnight on the 15th, Pirch I. had his whole corps (31,758 men) at Mazy, near Sombref, while Thielmann was a mile or two in front of Namur. At ten o'clock at night of that day, Bülow was still at Liége, far off. Thus Blücher by midnight of the 15th had three corps, or nearly 80,000 men, within sixteen miles of the enemy. What had Wellington done? We have seen that news of the French advance was sent to him on the 12th. Sir Hussey Vivian, whose Brigade of Cavalry was near Tournai, reported to him on that day that the French were preparing to attack. He made no change in his dispositions. On the 15th, at nine in the morning, he received a dispatch from Ziethen, written from Charleroi, announcing that the advanced posts on the Sambre were attacked. Still no movement was made. The first order for concentration came from General Constant de Rebecque, the Chief of Staff of the Prince of Orange, at two o'clock in the afternoon. It was a partial order to the Second Dutch-Belgian division, which was the extreme left of Wellington's army, to concentrate at Nivelles and Quatre Bras. Information of these orders was sent to Wellington at Brussels, but he still ordered no general movement. Siborne says that the Prince of Orange, who was in command of the First Anglo-Allied Corps, also forwarded to Wellington a report which he had received from his outposts, stating that the French had attacked the Prussian advanced posts on the Sambre, and that this report reached Wellington at five o'clock p.m.

Between eight and nine o'clock that evening came a letter from Blücher, saying that Thuin had been attacked, and that Charleroi appeared to be menaced. Then Wellington gave his first general order for concentration. Siborne says this order was given about five o'clock in the afternoon, but Charras has proved conclusively that it was not sent until between eight o'clock and half-past nine in the evening.

There was, at the same time, a special order to the corps of the Prince of Orange. It prescribed that the Perponcher Division, part of which had been since noon disputing the Brussels road with the French at Quatre Bras, a fact of which Wellington was unaware, should go to Nivelles. At ten o'clock, further news had come in. "After orders" were issued, with the view of completing the concentration. It was this news which broke up the Duchess of Richmond's ball, so well known from Byron's lines. We cannot repeat the orders, from want of space, but they can be seen in Siborne. If they had been carried out, the Anglo-allied army would have drawn away from the Prussian. The extremity of the left wing would have been five miles west of the Brussels road. and eleven miles from Sombref, where the Prussians were collecting.

At eleven o'clock at night, more precise intelligence came in, and fresh and more urgent orders were sent out. But through all appears the idea that the French would strike at Brussels, by way of Nivelles or Braine-le-Comte, not by the Charleroi road.

The result of this delay and false movement of Wellington was favourable to Napoleon. It left him free to deal with Blücher alone. He had counted justly on Wellington's slowness and Blücher's rashness. His *coup* appeared, therefore, to have all the elements of success. The heroes of the day were, however, the brave Prussians of Ziethen's Corps, who had stopped the French at Gilly, and Prince Bernhard and his Nassauers, who had stopped them at Frasne.

ACT II.

SCENE :—LIGNY AND QUATRE BRAS.

Time:—16th June, 1815.

At nine o'clock on the evening of the 15th Napoleon had returned to Charleroi. Wearied out, he threw himself on a bed to get some rest. About ten o'clock Ney left Gosselies, and reached Charleroi about midnight. He and the emperor had supper together, and a long conversation. It was two o'clock on the morning of the 16th when they separated. Some topics, unpleasant to both, were doubtless avoided, and their old friendship seemed completely rëestablished. So far as anybody heard, the emperor had no reason to complain of the marshal. The plan of campaign must necessarily have been talked over, but no definite decision seems to have been communicated to Ney. It would have been better for France if both Napoleon and Ney had rested, instead of talking over old times.

In June the nights are short, and the day dawned shortly after Ney went to his outposts. For the bulk of the army, military operations had ceased at seven or eight o'clock of the evening before. The troops had had time to rest. They were, moreover, in good spirits, and anxious to advance. On the 15th they had started at half-past three. On the 16th the divisions in rear of the left could have been closed up to the front very early in the morning. Ney would then have had 22,254 men in hand, and D'Erlon's 20,000 close behind. If he had pressed on at any hour from four o'clock in the morning up to ten or eleven, with his 22,000 men, he would have overwhelmed all before him. Prince Bernhard and his 4,000 Nassauers held their position all night, and were not reinforced till about four in the morning, when General Perponcher marched the rest of his brigade there, making in all about 7,000 men, with sixteen guns. The Prince of Orange, who was the general in command of the first corps, to which Perponcher's Division belonged, arrived about six o'clock, but brought no reinforcements: in fact, no more came up at all, until three or half-past three o'clock in the afternoon. The Duke of Wellington was on the ground at eleven o'clock, but brought no troops. When Ney did attack, at two o'clock, he only attacked with not quite 10,000 men of all arms. By three o'clock he had 17,615 in action, but during the whole of the rest of the day, he only had 22,000 men engaged, and of these only 15.750 were infantry, one of his infantry divisions (Gérard's, 4,297 strong) having been withdrawn from him by Napoleon. He made no use of D'Erlon's corps, 20,000 strong. The delay on the left was most disastrous to the French. What was the situation elsewhere?

We have seen that at midnight of the 15th the only Prussian corps in the immediate front of the French centre and right was Ziethen's - 32,692 men, less the loss of the 15th, say 1,500—say 31,000 men with 96 guns. The nearest corps to Ziethen was that of Pirch I., three divisions of which were at Mazy, nine miles from the front. These three divisions arrived there from Namur, in obedience to Blücher's order of the evening of the 14th, at three in the afternoon of the 15th, and halted at that place. They did not advance to Sombref, face to face with the French, until about ten o'clock in the morning of the 16th, when they were joined by their fourth division, and that was the time when Ziethen received his first immediate support. Up to that hour he had been alone in front of the French, and subject to be attacked by Napoleon with the centre and right of the French army, except such part as had not crossed the Sambre. The result of such an attack could not be doubtful. The next nearest corps to Pirch I. was that of Thielmann, but he was close to Namur, twenty miles distant, during the whole night of the 15th, and only commenced to advance from Namur about seven o'clock on the morning of the 16th. He arrived at Sombref about twelve o'clock of that day.

Three cannon-shots were heard from Fleurus at half-past two in the afternoon. They were Napoleon's signal for attack. By that time he had to deal with 90,000 Germans. Three-fourths of Blücher's army were concentrated and well posted for defence.

Ney, as we have seen, had waited until two o'clock to commence his attack on the left. What caused the delay?

The French army was anxious and ready to fight. Everything depended on prompt action. Had such been the case, Ney with

40,000 men would have overthrown 7,000 troops, many of whom were doubtful, being Dutch Belgians suspected of French sympathies, and with no supports at hand. Napoleon with 83,000 would have had to attack 31,000, true, with another 31,000 to support them, but that support nine miles away. The object of the sudden attack was therefore possible of accomplishment. The question is, did Napoleon display the energy which the crisis demanded, or did he press the advantages so far in his favour? It must be remembered that fully 25,000 of the French centre and right had not crossed the Sambre on the night of the 15th. It required two or three hours at least to get these troops over, and as they were the reserve artillery and heavy cavalry, besides Lobau's infantry, 10,000 strong, it was absolutely necessary to wait for them. Again, Gérard's corps was at Châtelet, and had to be moved up to Fleurus, about seven miles, while Vandamme had five miles to cover. The Guards had nine miles to march from Charleroi to reach the front.

In view of these facts, and bearing in mind that Napoleon had to wait for the reports of his various reconnoitering parties, any charge of too great delay on his part on the morning of the 16th appears unreasonable and unfair. He rose at five o'clock. His orders to his right to concentrate were sent out before eight o'clock, those for Ney before nine o'clock. He himself reached the front about noon. The French left and centre were in position by one o'clock, and the attack on the Prussians began at two. It is not easy to see how it could have begun much earlier in the day. At the same time he was doing all he could to bring up his left without actually going over in person. He sent Ney a dispatch early in the morning, asking for exact information as to the position of his various corps. As above stated, he sent a general order of movement, and also a personal letter, giving full explanations of the plan of operations before nine o'clock. He sent another dispatch at ten o'clock in reply to a hesitating message from Ney. He sent another at two, and another at three, or a little after. All were urgent expressions of his desire that Ney should advance, and if possible manœuvre to join the right. But Ney, or rather Ney's subordinate, Count Reille, for reasons satisfactory to himself, did not think fit to obey at once the first order to advance, which reached him about half-past ten. Having asked further instructions from Ney, the order to advance was repeated, but he did not come into the field until one o'clock.

Napoleon judged correctly enough that the dispersed Anglo-allied forces could not be collected in time for serious resistance to his own forces properly handled, but Ney's want of perception of the necessity for a strenuous advance lost the emperor the advantages which should have been gained on the left.

Ney on the left and Napoleon on the right were simultaneously engaged from about two o'clock. Napoleon defeated Blücher. What then did Ney effect? All that can be said is that he prevented Wellington from joining Blücher. This was no small achievement. Wellington, after arriving at Quatre Bras at half-past eleven, rode over to Blücher and promised him that by three or so in the afternoon the English army would join the Prussians. A vain promise never kept. The Duke found Ney in his road and the way was barred. Could Ney have done more than he did? It has been shewn that he could, had he acted on his orders more promptly. But it has been shewn further that the Marshal's whole force engaged was never more than 22,000 men, and that he made no use of D'Erlon's Corps of 20,000 men.

This episode is the most inscrutable in the whole campaign. The absence of these twenty thousand men alone prevented Ney from inflicting a decisive defeat upon Wellington at Quatre Bras. Siborne, who is the Duke's most uncompromising admirer, explicitly admits this fact. How did it happen?

It seems impossible to give a satisfactory answer. But the facts seem to be as follows: When Ney got his orders from Napoleon at half-past ten o'clock in the morning to advance, D'Erlon was at Jumet. (See map.) He was ordered by Ney, as part of the general movement, to advance as far as Frasne, detaching one division to Marbais. At twelve o'clock he commenced his march. Hearing the action going on in front, he left his column and rode on in advance to Frasne. He drew rein there, and while conversing with some of the superior officers was joined by General Labedoyère, who had come from Napoleon. That general showed D'Erlon a pencil note which he was taking to Ney, and which ordered the Marshal to detach D'Erlon's Corps towards Ligny. He added that he (Labedoyère) had already given the order for the change of direction of D'Erlon's column, and pointed out to D'Erlon himself the direction in which to go to join it.

Ney, in a letter dated the 26th June, 1815, complains that Napoleon had taken away D'Erlon's Corps without notifying him (Ney), and having, therefore, to act without D'Erlon, the battle of Quatre Bras was lost. D'Erlon's account of the matter seems to contradict Ney's statement. Col. Heymes, Ney's Chief of Staff, confirms D'Erlon's account, but says that Col. Laurent, not General Labedoyère, was the aide who carried the message. As D'Erlon was put in motion by Ney about eleven o'clock, in obedience to Napoleon's letter and second despatch, and as the distance from Jumet to Frasne is a little over nine miles, and as D'Erlon galloped on in advance of his column, he must have met General Labedoyère in about an hour and a half, or two hours, after eleven o'clock—say one o'clock. Now any order sent from Napoleon to Ney by the hand of General Labedoyère, and which reached Frasne by one o'clock, must have left Charleroi very shortly after half-past ten, as Charleroi is about ten miles from Frasne—if sent from Fleurus it would be eight miles. The order which Labedoyère is said to have carried, and to have shewn to D'Erlon, was contradictory of Napoleon's third despatch, and not only of that despatch, but of the whole of the previous second despatch. What had happened so early in the day to induce Napoleon to take away the first corps from Ney? The only reason which appears at all satisfactory is, that Napoleon, as he descended from his carriage at Fleurus, at twelve o'clock, saw that there was urgent need in that part for D'Erlon just then. Instead of having only a part of the Prussian army, he found three-fourths of it in front of him. And yet this explanation is not quite satisfactory, because later on in the day, namely at two o'clock and three o'clock, Napoleon sent two more despatches to Ney. The first repeated the order to attack, and informed Ney of the arrangements for Grouchy's attack at half-past two on Ligny, and stated that there was a corps of troops (not an army) to attack. The second informed Ney that the action was at its height, and ordered him to manœuvre towards the emperor. Neither of these despatches says one word about D'Erlon, or intimates in any way that he had been withdrawn from Ney. It could not be either of these which Labedoyère shewed D'Erlon, because the first says nothing about D'Erlon's moving toward Ligny, and the second was sent too late to have reached D'Erlon at the hour he and his division were on the road to Frasne.

Again, in a despatch written by Napoleon to Ney the next day (the 17th), Napoleon complains that the marshal had not united his divisions. He says: "If the corps of D'Erlon and Reille had been "together, not an Englishman would have escaped of the corps which "attacked you." The despatch then goes on: "If Count D'Erlon "had executed the movement on St. Amand which the emperor "ordered, the Prussian army would have been totally destroyed, and "we should have taken perhaps 30,000 prisoners."

This incident of the turning aside of D'Erlon's column is one of the enigmas of history. We have stated all that we have been able to ascertain about it. We cannot accept any of the published explanations as satisfactory; and now the actors in the drama are dead, there is no hope of any solution of the difficulty.

Where did D'Erlon go when he left his proper line of march? If the commencement of the incident was singular, its conclusion was still more so. The new line of march of D'Erlon led him towards Napoleon. The heads of his columns showed themselves in Napoleon's left rear about half-past five in the afternoon. They must either have been longer on their cross-march than the length of the march warranted, or they must have been very much later than eleven o'clock in starting from Jumet. Whatever the truth may have been, there is no doubt on one point: their arrival was unexpected. Nobody knew who they were. Napoleon sent an aide-de-camp off at full gallop to find out, and postponed a threatened attack on the Prussian centre until the messenger should return. At half-past six the aide-de camp came back with the information that it was D'Erlon's column, about two miles from St. Amand, exactly where it was needed for Napoleon's purpose. Charras says: "Let the order be given. In an hour twenty "thousand men of all arms will debouche on Wagnelée, on Bry, rolling "up in rear Blücher's right wing on his centre, while he is assailed "in front by Vandamme and Gérard, reinforced by the whole reserve. "The plan conceived by Napoleon will be realized. There will not "escape 20,000 Prussians. The order is not given, D'Erlon is not "summoned." But the fact seems to be, according to the best evidence, that Napoleon did summon D'Erlon more than once, but that Ney, at the same time, also repeatedly and urgently ordered D'Erlon to return to him, being in the very throes of his struggle at Quatre Bras, and that D'Erlon thought it best to obey the marshal under whose immediate command he had been placed, and not the emperor. It seems, at first sight, unlikely that such should be the case, and Charras disputes the fact; but, on a fair examination of the whole evidence, the conclusion just stated is the most probable.

Instead of advancing to assist Napoleon, D'Erlon having been summoned by Ney to return to him, countermarched his men and arrived at Frasne too late to help Ney, as the battle of Quatre Bras was over before he got there. Twenty thousand of Napoleon's best troops marched and countermarched on this memorable day. Their absence from one field robbed the French of what undoubtedly would have been a decisive victory. Their presence on the other field would have turned an indecisive advantage into a complete triumph. Ligny would have been a second Jena. It would have been to the Prussians what Waterloo was two days afterwards to the French. Napoleon's calculations were correct. His left wing found at first practically nothing to oppose them. His right wing and centre were sufficient to defeat the Prussians. He was not responsible for the false movement which so fatally weakened both wings without benefiting either. Had Ney swept the Brussels road clear of the Anglo-allied army, Napoleon's anticipations of being in Brussels that night would probably have been realized. That it was not so was partially Ney's fault. It was not Napoleon's.

ACT III.

SCENE:—ON THE ROADS TO WATERLOO AND WAVRE.

Time:—17th June, 1815.

The morning sun of the 17th June, 1815, rose on two ghastly fields. At Quatre Bras over nine thousand combatants had been either killed, wounded or missing, while at Ligny about twenty thousand represented the loss to both sides. Perhaps altogether 30,000 men *hors de combat.* We have set forth the actual results of the previous day. Ney had blocked Wellington, Napoleon had defeated Blücher. All had been over by ten o'clock. How had the night been passed? To appreciate what took place it will be necessary to consult the map. Blücher, being forced to retire from Ligny, had two courses open to him. He could retreat by way of Namur, but that would separate him from Wellington, or he could retire to Wavre, from which place it would be comparatively easy for him to rejoin Wellington either before or behind Brussels. With desperate tenacity he, or rather his Chief of Staff, Gneisenau, chose the latter, and the whole Prussian army, including Bülow's corps, which came up too late for Ligny, was massed upon Wavre by the next afternoon after their defeat at Ligny. Their retreat was not only not harassed by the French, but its very line was unknown to them. That it was so was a cardinal error which led directly and conclusively to Napoleon's overthrow. The more the campaign is studied, the more it appears that all other mistakes on both sides are dwarfed before this one. On Napoleon's side, Ney's inaction, D'Erlon's countermarch, were almost compensated for at the end of the 16th. On Wellington's part, his want of penetration was made up for by the intelligent disobedience of General Perponcher, and the stubborn courage of the British infantry. This error was so serious that its consequences are plainly visible in the grand catastrophe. We are quite unable to account for Napoleon's course of action. We have seen him mass his troops on the 14th, cross the Sambre on the 15th, fight Ligny, and urge on Ney at Quatre Bras on the 16th. We have seen him recognize instinctively the true situation of the Anglo-allied force, and with superior calmness quiet Ney's hesitation. We have seen him hurl at the Prussian army his old guard, a thunderbolt which laid it prostrate. Up to this point he may be said to have been quite successful enough to satisfy the demands of his proposed campaign, although not so completely successful as his plans deserved. Why did he not press his advantage? There is a mournful interest in contemplating him. We see pass before him his former glories. The Bridge at Lodi, the Pyramids, Austerlitz, Marengo. We hear the chant of the Marseillaise as they lead the van of the avenging people. We see a cruel system of despotic bondage torn away, a wakening of the fresh young life of freedom. The brave soldiers, whose bodies lie scattered in far distant fields, come before us in spirit. We see them approach their chief as he lies asleep, and with mute gesture attempt to rouse and save him from his coming fate, then pass away with dumb anguish as they perceive his lethargy. Brave children of France! Your zeal for liberty ofttimes outran discretion. You were guilty of many crimes, many follies, but you were faithful to the flag under which you fought, and to the general who led you to triumph. You came in spirit from your graves to congratulate him on his last victory and vainly to warn him of his coming defeat. There is no picture in his history so painful to our mind as the one we contemplate. The mighty emperor, surrounded by his victorious army, justly proud of themselves and him, flushed by success, confident of complete triumph; and on the next day but one, at the same hour, behold these very troops, that mighty emperor, flying in panic-struck confusion before their defeated foe, now become a pursuing fury. Although we recognize that the result was probably better for the human race, we cannot help feeling that species of gnawing regret which eats at the heart when it recurs to what might have been, but is not.

Napoleon, instead of sleeping on the field, went back to Fleurus about eleven o'clock. It is generally admitted that before he lay down, he gave orders to Grouchy to send Pajol's light cavalry and Teste's infantry after the retiring Prussians. Thiers says he also sent orders to Ney to be under arms at daybreak, to press the English again. These latter orders are stated by no other author, but are referred to in Soult's despatch of the next morning reiterating them. Even admitting the genuineness of the other orders, those for the pursuit of the Prussians appear to be utterly inadequate. With every disposition to be chary of criticising such a man as Napoleon, we must confess that the inadequacy of these orders is a mystery to us, for which we can find no satisfactory solution. Napoleon must have miscalculated the effect of the battle. Perhaps he undervalued Blücher. Some authors attribute his lethargy to his enfeebled bodily condition—it seems to us very wrongly, on a fair consideration of all Napoleon did achieve. But whatever the reason, the fact is there that the Prussians were allowed the whole night and the next morning to retire on Wavre, and no sufficient attempt was made to follow up their traces.

Napoleon was perfectly justified in turning his whole strength immediately against the English. His plan was to throw his centre where it was needed, and he was quite right to transfer it at once from his right to his left. But why he did not ascertain more exactly what his right had to do, is very difficult to explain. He seemed to have thought that the Prussians would retire towards their own base, namely, Namur, not towards Brussels by way of Wavre, as they did. His first orders were to follow them towards Namur, and there appears to be little doubt but that, in this instance, he was mistaken in the inference he drew from his success. The person to whom is due the credit of the masterly Prussian retreat, which unquestionably saved the campaign, is Gneisenau, whose name is comparatively unknown. Napoleon's mistake, for it seems to us that it can be called by no other name, undoubtedly contributed to Waterloo.

The events of the day were as follows: Napoleon rose at five, and sent off orders for Lobau's Corps to march towards the left, followed by the Guard, and then the heavy cavalry. About six o'clock, General Flahault returned from Ney, and reported the result of Quatre Bras. Napoleon immediately sent a written order through Soult to Ney, explaining the position of affairs, and urging him to advance. Charras says this order was not sent off until eight o'clock; Thiers says about seven o'clock. Napoleon left Fleurus for the front about eight o'clock. Other orders were sent out at the same time for a review of the troops who had fought at Ligny. This review began about nine o'clock, and lasted till nearly noon. Meantime Lobau, the Guard, and the heavy cavalry were moving to the left, and reports from the reconnaissances were coming in. It seems to have been Napoleon's plan that Ney should advance, on the theory that the English could not oppose him, in view of the fact that the Prussians were in retreat. Ney could not advance, because Wellington was in front of him with about forty thousand men. They were not withdrawn until about one o'clock. By noon, Napoleon sent out an order by Soult to Ney to advance, and followed it immediately himself. This fact, which is important, is fixed by the despatch from Soult to Ney, which bears the date *à midi*. Before he started Napoleon gave his famous orders to Grouchy. The latter must, then, have received them between twelve and one. These orders were verbal. Thiers gives a version of them which contradicts that of Grouchy. The historian appeals to Marshal Gérard, and other witnesses, and they appear to us exactly the orders which Napoleon would have given. The *fons et origo mali* was undoubtedly the impression which the staff had, if Napoleon himself did not share it, that the Prussians were in retreat upon Namur; and from this time to the end of the campaign we see Grouchy wasting his strength hunting for Blücher exactly where he was not, and entirely ignorant as to what line he ought to take. For the present we leave him, and follow Napoleon. The latter was delayed in the advance by the resolute front shown by the English cavalry, who were protecting Wellington's retreat. He retreated as soon as he ascertained Blücher's disaster, but only to make a better stand. The English horsemen gave the French a taste of what they might expect the next day. Between the effect of their charge at Genappes and a terrible thunder-storm, it was evening before Napoleon came face to face with Wellington at Mont St. Jean. The emperor deployed his cavalry and guns to feel whether he had a rear guard to deal with, or Wellington's whole army. When he ascertained that it was the latter, we read that he was pleased. He was destined to be more than satisfied, but the question is, was he justified in his opinion that the game was now in his own hands? We will endeavour to give a fair answer to this question, founded on the statement of the position of the various armies, as stated in the sequel.

ACT IV.

SCENE:—WATERLOO AND WAVRE.

Time:—18th June, 1815.

It is half-past eleven in the morning, Marshal Grouchy is sitting at breakfast in the garden of the notary Halbaert, at Sart-les-Walhain. With him are Gérard, Vandamme, Valazé, an engineer officer, and Baltus, in command of the artillery. Suddenly Col. Simon Lorrière enters and says: "I hear firing." The party go out to the garden, and there heavy reports are heard, so heavy that the ground seems to tremble. "It is the emperor, he is fighting the "English, let us join him," says Gérard, "We should march "towards the guns." "No," says Grouchy. "My orders are to "move to Wavre, and to Wavre I am going." The decision was fatal to France, disastrous to Napoleon, and damning for Grouchy's reputation. To correctly appreciate the situation it is necessary to retrace our steps to the position of matters after Ligny, that is on the evening of the day before the one of the incident above related.

We have seen that Napoleon sent out Pajol's cavalry in pursuit of the Prussians. Pajol took the Namur road, that is eastward towards the French right. The Prussians however were by that time in retreat towards Wavre, that is northwards, so as to join Wellington. There has never been so masterly a retreat, or so determined a strategy, as that of Gneisenau. It is impossible to give the Prussian army too much credit for their steadiness and courage during this retrograde movement. While retiring they at the same time used their cavalry in constant and vigilant patrolling, and in this respect were as active as their descendants were in 1870, while the French were equally inactive. The result of their movement was that by nightfall of the 17th the whole Prussian army of ninety thousand men were in and around Wavre.

The Duke of Wellington only received news of the disaster at Ligny the next morning. He then commenced his retreat, also ably managed, from Quatre Bras about ten o'clock, and arrived at Waterloo about five in the afternoon.

Napoleon on the 17th, after moving off Lobau's Corps and the Guards from his right to his left, about one o'clock in the day, perhaps a trifle earlier, entrusted his right wing to Grouchy, and gave him at first verbal, then at two o'clock written orders. These latter directed Grouchy to march to Gembloux. This dispatch is said to have been suppressed by Grouchy in the controversy which arose. It was first printed in 1842. Its closing sentence is: "In all cases "keep constantly your two corps of infantry united in a league of "ground, having several avenues of retreat, and post detachments of "cavalry intermediate between us, in order to communicate with "headquarters."

Owing to a combination of circumstances entirely beyond Grouchy's control, and for which he can in no way be held responsible, he with his men on the evening of the 17th was only at Gembloux. He was, moreover, quite ignorant of where the Prussians were. He had, however, been at fault in not leaving detachments of cavalry between himself and the emperor, as the latter had ordered.

Napoleon himself had moved off to the Brussels road and followed the advance of his troops, delayed by a tremendous thunderstorm, which turned the country into a sea of mud, and reached the Caillou farm, in front of Mont St. Jean, about half-past six, to find the English in position and ready to give battle. He reconnoitered their position, the reconnaissance lasting until ten o'clock, then returned to his headquarters, which were established at the farm of Caillou above referred to. We are now in a position to appreciate why Napoleon was delighted that the English were going to make a stand alone. Apparently a puzzle why it should have pleased him, it is accounted for from his point of view. He had succeeded in his plans. He had separated the two allies. He had beaten one, not quite so thoroughly as he thought, but so far as he knew sufficiently to keep him out of any fighting for some time. He had left enough of his own army with Grouchy to watch the defeated enemy, and had given him sufficiently plain instructions what to do. Now he had with himself his whole centre and left, with superb cavalry, enormous force in artillery, and the very *élite* of his infantry, and he was not personally aware, although some of his generals were, what the British soldier can do. He knew however that the Duke of Wellington's army was a very composite one, and he had good grounds for knowing that at least a third of it could not be trusted. When all these considerations are taken into account, it is not wonderful that Napoleon was glad that before him lay Wellington alone.

On his return to his head-quarters he issued the necessary orders for the battle of the next day, and, if his own statement is to be believed, he sent a special order to Grouchy. This order Grouchy, to his dying day, protested he never received. Many writers assert that Napoleon never sent it; but, on considering the orders known to have been sent, and Napoleon's plan of operations, we cannot believe but that it was sent. It was the very thing which Napoleon would be likely to do—keep touch with his right. We also believe that Grouchy did not receive it.

Napoleon, having retired to rest, rose again at two o'clock, and re-commenced his reconnoitering, which he kept up during the remainder of the night. The rain continued, but cleared up about four or five o'clock. If it had been possible, Napoleon would have attacked then, or very soon after, but the ground was wet for artillery. It was therefore necessary to wait. Moreover, Napoleon, as he alleged, expected Grouchy to close up to him, such being the substance of the order of the evening before, and a later one sent off about three in the morning. At ten in the morning, he sent an aide-de-camp to Grouchy, with a third order to the same effect. On these two considerations, he decided to postpone the attack on the British, and after sending off the aide-de-camp to Grouchy at ten o'clock, he slept for an hour. Then, waking at eleven, he gave the signal for attack, and at half-past eleven the Battle of Waterloo began by the discharge of one hundred and twenty guns. This cannonade lasted half an hour, and these were the guns heard by Grouchy, and towards which Gérard begged him to march.

We have thus ascertained the position of Napoleon, Wellington, and Grouchy. Where was Blücher at this time?

Communications passed between Wellington and Blücher on the 17th, in which the latter promised that he would assist Wellington, not only with two army corps, but with his whole army. He added that if Napoleon did not attack on the 18th, they would attack him on the 19th. Such was the spirit in which the men of that day fought for their homes. In pursuance of this promise he started his four corps early on the 18th. Bülow's was the leading division. Its advance reached St. Lambert (see map) about noon, but its main body not until three o'clock. Ziethen's Corps had to cross the line of Bülow's march, and, owing to the delay thus caused, did not reach Ohain (see map) until six o'clock. Pirch had to leave half his corps for the defence of Wavre against Grouchy, and joined Bülow with the other half about half-past seven in the evening. Thielmann was held at Wavre by Grouchy.

Thus, at half-past eleven, Bülow's was the only Prussian column near Wellington, and he was at St. Lambert, five miles from the fighting. From that time to half-past four, this corps was straggling through horrible roads in the valley of the Lasne, in order to seize a position on the French right. At that hour they entered into the operations of the field of Waterloo.

The reader will now understand (if he consults the map) what influence Grouchy could have had by advancing towards Planchenoit, instead of on to Wavre. It is, perhaps, only curious speculation, but it is worth following out, as the turning incident in the campaign. There is not much doubt upon one point, at all events: Grouchy could have considerably delayed, if he could not have prevented altogether, Blücher's junction with Wellington on the 18th. Granting that he was where he was in obedience to his orders; granting that Napoleon was as much responsible as he was for the waste of strength, and useless cavalry marches on the wrong flank; granting all this, giving him every credit for every possible effort hitherto; now, at all events, he should have seen the mistake. There was the firing, there were the Prussians plainly seen on the road towards it,—the very privates saw what was to be done, but the general was blind.

It is useless to fight the Battle of Waterloo over again. Thanks to the old stubborn valour of the British soldiery, and to the tenacity of the British commander-in-chief, who knew his men, and did not spare them, the British held their own. They had all they could do to manage it. It is easy to appreciate the influence which the

Prussians had, when we recollect that, at one o'clock, Napoleon had to detach two divisions of cavalry; then, somewhat later, two infantry divisions—in all, over ten thousand men; that he had to follow these by the Young Guard, and by part of the Old Guard; and that he was really fighting two battles at once.

The strength of the Prussian army actually engaged at Waterloo alone was over 51,000 men.* Their loss there was 6,998, while at Wavre they lost in addition 2,476, in all 9,474 men. The British loss proper was 6,936. That of the King's German Legion and other German troops under Wellington's command was 4,494. The Dutch-Belgians lost 4,147, of which 1,627 were "missing." Exclusive of the Dutch-Belgians, Wellington's total loss was 11,430. These figures shew that the Prussians must have done as severe fighting as the British, and prove they did not come on the field merely to witness an English victory. If Napoleon had had his whole army, and, what is more, his undivided attention to bestow upon Wellington, it is difficult to believe that he would not have been successful. Even as it was, with a large part of his force detached to one flank, and with his attention continually distracted to that flank, he captured one position, La Haye Sainte, he almost annihilated Wellington's cavalry and decimated his infantry. He drove the Dutch-Belgian contingent clear off the field. But he could not shake the British squares. Once more steadiness was more than a match for dash.

Had Grouchy obeyed the dictates of common sense and good judgment, he would probably have secured for Napoleon the opportunity of dealing with Wellington single-handed. He failed to do so, although it seems to us he might and ought to have done so. The result was that by eight o'clock in the evening Napoleon was overmastered, his army was in flight. The glories of the Republic, of the Consulate, of the Empire were for a time effaced by so crushing a disaster. History however will be more just than contemporary depreciation. The candid student will perceive that Napoleon was worthy of his reputation. His general plan of operations was capable of accomplishment, and its defeat is attributable primarily to the useless countermarch of D'Erlon, then to the delay in following up the Prussians, for which as General-in-Chief he must be held more than partially accountable. But even the D'Erlon *contretemps* and the delays of the 17th were remediable on the 18th. Had Grouchy been equal to the occasion, the plan of campaign would have been successfully carried out. It was not to be. The sun of Waterloo set, "and the "land had rest forty years."

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* By half-past four o'clock, 15,906 men and 64 guns.
By six o'clock, 29,244 men and 64 guns.
By seven o'clock, 51,944 men and 104 guns. —*Siborne.*

The President said that the paper that they had just listened to was one of great value. Though a long period had elapsed since the battle of Waterloo and much had been written respecting it, Mr. Kingsford had done wisely in again opening up the subject. The one-sidedness of historians was well known, and there were still several points that required to be settled. He himself had been present at an excited discussion between a number of English and Prussian officers; each party contending that it was purely a victory for their respective nationality.

SEVENTEENTH MEETING.

Seventeenth Meeting, 27th March, 1886, the President in the Chair.

The following list of donations and exchanges was read :

1. Canadian Entomologist, Vol. XVIII., No. 3.
2. Transactions of the Field Naturalists' Club, No. 6, Ottawa.
3. Science, Vol. VII., No. 163.
4. The American Antiquarian and Oriental Journal, Vol. VIII., No. 1, Chicago.
5. Johns Hopkins University Circulars, Vol. V., No. 47.
6. Thirty-Second Annual Report of the State Historical Society of Wisconsin.
7. Fifth Annual Report of the United States Geological Survey, 1883-84.
8. West American Scientist, Vol. II., Nos. 13 and 14.
9. Bulletin of the Buffalo Society of Natural Sciences. Vol. V., No. 1.
10. The American Naturalist, April, 1886.
11. The Electrical Review, March 25, 1886.
12. The Chemical News, March 12, 1886.
13. Journal of the Liverpool Astronomical Society, Vol. IV., Nos. 3, 4, 5.

14. Wochenschrift des österreichischen Ingenieur und Architekten Vereines No. 10, März 5, 1886.
15. Cosmos, March 8, 1886.
16. Electricité, March 6, 1886.
17. Bollettino della Società Geografica Italiana, Serie II., Vol. XI., Fasc. 2.
18. Boletin de la Real Academia de la Historia, Tomo VIII., No. II.
19. Boletin da Sociedad de Geografia de Lisboa, 5 Serie, No. 7.
20. Berichte über die Verhandlungen der K. Sächsischen Gesellschaft der Wissenschaften zu Leipzig, Mathematisch-Physische Classe, 1885, 37 Band, Heft III.
21. Journal des Sociétés Scientifiques, 10 Mars, 1886.
22. Bulletin de la Société Impériale des Naturalistes de Moscou, Anneé 1885, No. 2.
23. Tydschrift voor Nyverheid en Landbouw in Nederlandsch Indië, Deel XXXII., Aflevering I, Batavia.
24. Bulletin de la Société Mathématique de France. Tome XIV, No. 1, Paris.
25. Verhandlungen des naturhistorischen Vereines der preussischen Rheinlande und Westfalens, 41ster Jahrgang, 2te Hälfte, Bonn.

Total 28.

Messrs. Browning and Henderson were appointed Auditors.

Mr. R. R. Baldwin was elected a member.

Mr. T. B. Browning read a paper on "The Fishery Question."

Mr. Rouse thought that the limit should be increased to nine miles.

Mr. Bain referred to the scarcity of books on this subject. When the Halifax Fisheries' Commission investigated the matter they could not find any works in the English language on the natural history of the cod. They had to hunt up books in other European languages. They found one in Norwegian, these people, it seems, having paid more attention to the subject.

The President thought that the Gulf of St. Lawrence should be considered an inland water, bounded as it was by British territory. It was almost as much within British territory as Lake Winnipeg. He hoped that the care and preservation of these waters would receive that consideration from the British people that the importance of the subject demanded.

EIGHTEENTH MEETING.

Eighteenth Meeting, 3rd April, 1886, the President in the Chair.

The following list of donations and Exchanges was read :

1. From W. A. Douglas, Esq., B.A:
    (1) Ontario Loan & Savings Companies.
    (2) Harmonies and Antagonisms in the Social Forces.
    (3) John and his Master.
2. On the proposed change of time to a decimal system, by R. C. W. Goodridge.
3. Canadian Practitioner, April, 1886.
4. The Spectator, February 20th., 27th., and March 6th., 1886.
5. Science, Vol. VII., No. 164.
6. Magazine of American History, April, 1886.
7. Transactions and proceedings of the American Society of Civil Engineers, January, 1886.
8. Journal of the New York Microscopical Society, Volume I., No. 1, January, 1886.
9. American Journal of Science, April, 1886.
10. Journal of the Franklin Institute, April, 1886.
11. The Electrician and Electrical Engineer, April, 1886.
12. The Electrical Review, April 3, 1886.
13. Annual Reports of the Provost and Treasurer of the University of Pennsylvania for the year ending Oct. 1, 1885.
14. The Chemical News, March 17th., 1886.
15. Illustrated Journal of Patented Inventions, No. 61, March 18th., 1886.
16. Monthly Notices of the Royal Astronomical Society, Vol. XLVI., No. 4.
17. Proceedings of the London Mathematical Society, Nos. 253, 257.
18. Transactions of the Institution of Engineers and Shipbuilders of Scotland. 29th Session, 1885-86.
19. Transactions and Proceedings of the Botanical Society of Edinburgh, Vol. XVI., Part 2.
20. Records of the Geological Survey of India, Vol. XIX., Part 1, 1886.
21. Wochenschrift des österreichischen Ingenieur und Architekten Vereines. Wien, Nos. 11, 12, Mars, 1886.
22. Zeitschrift für Physiologische Chemie, X. Band, 3 Heft, Strassburg, 1886.
23. Electricité, 13 and 20 Mars, 1886.
24. Cosmos, 18 and 22 Mars, 1886.
25. Archivio di Letteratura Biblica ed Orientale, Anno 8, No. 2, Febbraio, 1886.
26. Verhandlungen der Gesellschaft für Erdkunde zu Berlin, Band XIII, No. 2.
27. Compte Rendu de la Société de Géographie, Paris, No. 6.

28. Bullettino di Bibliografia e di Storia delle Scienze Matematiche e Fisiche, Tomo XVIII. Giugno, 1885.
29. Bericht über die Senckenbergische Naturforschende Gesellschaft, Frankfurt a. M. 1885. Reiseerinnerungen an Algerien und Tunis, von Dr. W. Kobelt, Frankfurt a. M.

Total 36.

Mr. William Haldane was elected a member.

Dr. A. M. Rosebrugh read a paper on "Telegraphing to and from Railway Trains."

He said the first public test of the new railway telegraph, or the "air telegraph," as it is now called, took place on the Staten Island railroad on Monday, February 1st., when many messages were sent to and from the train while in motion, with an ease and speed which left nothing to be desired. The second public test was made on March 19 between Chicago and Milwaukee on the Chicago, Milwaukee & St. Paul railroad, when over 300 messages were interchanged during the trip to Milwaukee and back, and the test was quite as satisfactory as that on the Staten Island railroad. (The writer here explained the arrangement of the apparatus and the philosophy of the device by two drawings, one representing the arrangement on the cars and the other the arrangement at the railway station.) On the train, one wire is connected with the metallic roof of the cars, while the other is connected with the rails by means of the axle and wheels. At the station, one wire goes to the ground, while the other divides into branches, and is connected with three or more telegraph wires. A condenser is interposed in each of these branch lines, not as a necessary part of the air telegraph, but as a protection to the telegraph wires. Both on the train and at the station an induction coil, together with a vibrating reed, is used as the electric generator and a magneto-telephone as a receiver. The signals are given with the ordinary Morse key, which is inserted in the local circuit. When the key on the train is operated, the roofs of the cars become charged with electricity ; this charges the adjacent telegraph wires by static induction, and this in turn charges the receiving telephone at the station through the branch wires and condensers. On the other hand, the generator at the station charges the telegraph wires and the telegraph wires charge the roofs of the cars, which in turn charge the telephone on the train. The several factors that contribute to make the "air telegraph" a possibility are divided into four parts, namely, (1) the electric generator; (2) the receiver; (3) the inductive device, and (4) the line protectors. (1.) The electric generator consists of a local battery, a rheotome or automatic vibrator, an induction coil, and a transmitting key. The wire of the induction coil is short and of comparatively low resistance. This apparatus is sometimes called "the buzzer." The key is inserted in the local circuit, and when it is closed a strong interrupted primary current charges the induction coil, which in turn charges the condensers and line by induction. (2.) The receiver is the ordinary magneto-telephone, but is made small and light, and is secured against the ear of the operator. The signals cause a buzz or humming note in the telephone—a short buzz representing a dot, and a prolonged buzz a dash of the Morse alphabet. (3.) The inductive device consists simply of the metallic roofs of the cars connected together by metallic conductors on one side, and the railroad telegraph wires on the other, the one forming practically the positive and the other the negative plate of an electrical condenser. When one plate is charged by an electrical current the other becomes charged by induction, just as when a Leyden jar or a condenser is used. The writer was aware of Mr. Edison's suggestion that the intervening air becomes alternately polarized and depolarized by the alternating induced current and that it becomes actually a conductor of said current, but, to his mind, the laws of static induction seemed to sufficiently explain the action of the so-called air telegraph.* (4.) The line protectors have a three-fold object, firstly, to prevent crossing or grounding of the telegraph wires; secondly, to provide an unbroken circuit for the induced current during the opening and closing of the keys in the main line; and thirdly, to protect the main line instruments from being injuriously affected by the strong induced currents of the air telegraph. This is accomplished by the use of condensers. A condenser is inserted in each branch line and a condenser is used to bridge the Morse instruments at each way station. In a condenser two metallic plates, separated by some insulating material such as mica, or waxed paper, are pressed closely together, one plate forming one pole and the other plate the other pole of the condenser. The condenser is a block to the passage of the primary currents from the telegraph wire, but permits the passage of secondary currents by induction. The condenser renders it possible to superimpose induced currents upon telegraph wires without interference, and the use of the condenser renders simultaneous telephony and telegraphy not only possible but practicable. Turning to the question of priority of invention, he doubted not the members of the Canadian Institute would receive the announcement with satisfaction when he stated that the so-called "air telegraph" was largely a Canadian invention. The facts are as follows:—In September, 1877, a private telephone line was constructed in this city from King street up Church street to Charles street. This was before the magneto signal bells were introduced, and as there was no battery upon the line until some time after the line was constructed, it was necessary to devise other means for signalling. This resulted in the adoption of the ordinary Faradic medical battery for the generator, and the telephone diaphragm for the receiver. This was called the "buzzer," as it gave a buzz or humming sound in the telephone. A month or two later a telegraph system was devised in Toronto on this principle, namely, using an induction coil, a vibrator, a local battery and key as a transmitter, and a magneto-telephone as a receiver. In the spring of 1878 Mr. George Black of Hamilton made the important discovery that a telephone circuit may be established through an electrical condenser. This at once opened the way for using the telephone and other telephonic apparatus as a duplex on the ordinary telegraph wire, as it was found that by means of condensers an artificial or phantom circuit could be established for the telephone instruments independent of the telegraph signalling—the condensers acting in a threefold capacity: firstly, they prevented grounding or crossing of the telegraph lines; secondly, they bridged the interval of the opening of the telegraph key, and thirdly, they suppressed induction.

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* Since the reading of this paper before the Canadian Institute Prof. A. E. Dolbear, of Tufft's College, Mass., claims to have invented a system of electrical communication without wires. From the descriptions of the system that have been made public I infer that it is simply a modification of the Air Telegraph. Condensers are used on the one side in lieu of the metallic roof of the car, and on the other side in lieu of the adjacent telegraph wires. The two condensers are only a few rods apart. A. M. R.

This discovery forms the basis, not only of the air telegraph, but also of the Edison duplex "Phonoplex" and "Way Telegraph," as well as of the Van Rysselberghe "Telegraph *cum* Telephone" system now in extensive use in France and Belgium.

In all these cases induced electrical currents are superimposed upon the telegraphic circuit by means of condensers and both the primary currents of the telegraph system and the induced currents of the telephone system are used simultaneously and without interference. An application for a patent covering this invention was filed at Washington in June, 1878, and the patent was issued in February, 1879. Among the claims in this patent are the following:—1st. In a branch line, or a derived line of a voltaic circuit, the combination of a condenser, a telephone and apparatus for generating induced currents for signalling purposes. 2nd. The combination of two or more parallel telegraph wires with a branch line and condenser attached to each of said telegraph wires and with a common ground wire and with telephonic apparatus inserted in said ground wire. He did not wish to detract in the least from the credit due to Mr. Smith on the one hand for conceiving the idea, or from Mr. Edison and Mr. Gilleland, on the other, for developing it. His desire was simply to put the actual facts on record. With regard to the commercial value of the "air telegraph" and the possible position it is destined to take in commercial economy, he was not in a position to speak, he simply knew that it had excited much interest among railway men.*

The President said that it was gratifying to learn that in the improvements that had been made in the applications of electricity and the patents that had been obtained much was due to a Canadian. That Canadian was, though his modesty did not permit him to mention it, Dr. Rosebrugh himself.

NINETEENTH MEETING.

Nineteenth meeting, 10th April, 1886, the President in the Chair.

The following list of donations and exchanges was read:

1. Das Echo, July 25th, 1885, August 7th, 1885, December 18th and 25th, 1885, January 15th, 22nd, 28th., 1886; February 11th, 18th, and 25th, 1886; March 4th, 11th, and 18th, 1886.
2. The Spectator, March 20th, 1886.

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* A second paper by the same author, in continuation of this subject, was read before the Institute on the 8th January, 1887.

3. Science, Vol. VII., Nos., 165, 166.
4. Bulletin of the Philosophical Society of Washington, Vol. VIII.
5. Electrical Review, April 16, 1886.
6. Annual Report of the American Museum of Natural History for 1885-86.
7. The Chemical News, March 26th., 1886.
8. Transactions of the Manchester Geological Society, Vol. XVIII., Parts 14, 15, 16.
9. Proceedings of the Royal Society, Vol. XXXIX., No. 241.
10. Proceedings of the Cambridge Philosophical Society, Vol. V., Part 5.
11. Minutes of Proceedings of the Institution of Civil Engineers, Vol. LXXXIII., Series 1885-86, Part 1.
12. Wochenschrift des österreichischen Ingenieur und Architekten Vereines, No. 12, 19 März, 1886.
13. Journal de la Société Physico-chimique russe, Tome XVIII., Nos. 1, 2, St. Petersburgh, 1885.
14. Boletin de la Real Academia de la Historia, Tome VIII., Cuaderno III.
15. Journal des Sociétés Scientifiques, 17 Mars, 1886.
16. Abhandlungen des Tokio Daigaku, No. 10.
17. Revue des Langues Romanes, 3^{me} Serie, Tome 14^{me}, Juillet, Août, Septembre, Octobre, Décembre, 1885, Montpellier.

Total 37.

Messrs. Henry Holgate and Frederick B. Hodgins were elected members.

The President read the following paper :—

NOTES ON THE EARLY DEVELOPMENT OF ABORIGINAL WOMEN IN ALL LATITUDES.

BY PERCY W. P. MATHEWS, LL.D., M.R.C.S.E., ETC.,

Dominion Coroner for the N. W. Territories, and Medical Officer to the Honourable Hudson's Bay Company.

It is for the purpose of drawing attention to the early marriages of the more precocious natives of tropical climates, as well as to the marriages of mere children here, in the sub-arctic regions, that I pen these few notes, and also to become enlightened myself, by possibly giving rise to some discussion in connection with a subject that cannot be otherwise than interesting.

In the first place I will allude to the only statistics I can obtain on the subject in reference to the Tropics, and will advance those collected by Dr. Robertson, of England, and published in his Essays and Notes on the Physiology and Diseases of Women, in which he states that "the ordinary age at which women in Bengal commence to menstruate is twelve years;" and again Dr. Goodene, Professor of Midwifery at Calcutta, asserts that a large portion of Hindoo women bear children before they are fourteen years old, and the earliest age at which he has known a Hindoo woman bear a child is ten years. Dr. Curtis relates the history of a girl aged ten, who was delivered of a healthy child at the full term of pregnancy.

It will, I am sure, be thought unnecessary to adduce further instances, in support of the precocious development of children of the tropics, as it is greatly known and acknowledged; and I merely mention here that it is equally understood to be mainly owing to natural causes, insomuch as they refer to custom and to climatic influence.

It is to the early development of children of these northern climes, that I wish now particularly to draw attention, and to point to it as a full exemplification of the trite old saying, "extremes meet." Before passing on to the natives of the far north (the Eskimo), I will allude to the data that I have collected from various sources and mention, *en passant*, how trying an undertaking it is to make the "old Indian wife" disclose anything approaching trustworthy information; for assertions are made that will, on a little cross-examination, be utterly refuted; and further, their method of computing events by a species of incidental comparison necessitates their passing through a process of logical deduction before they can be settled upon. For instance, C. B. was "a wife" for the first time, "the year the Great Stone Chief (Dr. R. Bell) visited the settlement." We remember when that event took place, then refer to the register, and find the date of her birth; that is simple, but when you are informed that M. F. was a wife the year the wavies (snow-geese) were so thick on the East Coast of Hudson's Bay, as that was several years ago, and the occasion had not been particularly noted, the result is apt to be conjectural. But from my own notes of some years past, together with some intelligent help from the several Indian settlements, I have been enabled to compile a table on the subject; which leads me to infer, that if the histories of 500 women were taken, it would be found that the catamenia first appeared in these at the following ages:—

Between the	Tenth	and the	Eleventh	year in	22
“	Eleventh	“	Twelfth	“	150
“	Twelfth	“	Thirteenth	“	185
“	Thirteenth	“	Fourteenth	“	78
“	Fourteenth	“	Fifteenth	“	40
“	Fifteenth	“	Sixteenth	“	17
“	Sixteenth	“	Seventeenth	“	3
“	Seventeenth	“	Eighteenth	“	2
“	Eighteenth	“	Nineteenth	“	1
“	Nineteenth	“	Twentieth	“	1
“	Twentieth	“	Twenty-first	“	1
					500

I have myself noted only one case in which conception undoubtedly took place before the age of eleven, that of Lavinia Wastasicott, who gave birth to a fully developed child at the age of eleven years and six months, and another child within the year following. Another case that I was called upon to attend was that of C.G., aged twelve years, who was delivered of a fine child at the full period. Another, that of Ellen Wosie—about twelve years old—who gave birth to a child equally at the full period. I have noted three other cases at and before the age of thirteen, and there are several cases of between thirteen and fourteen. In short, I know of so many thoroughly well authenticated cases of conception having taken place between the ages of eleven and fourteen that I think them sufficiently interesting to note, as evidencing the precocious development of the Indian in the Sub-arctic regions of North America.

And further, as regarding precocious maternity, we observe the same to be the case when we travel northward. Indeed, among the Eskimo, early marriage, or rather co-habitation (a synonym for marriage), is more generally noted than among what may be termed Sub-arctic Indians. This fact has, I believe, been referred to by Arctic writers, but I am without authorities on the subject. It is, however, certainly borne out by facts which I myself have been able to gather. One Eskimo lad aged about sixteen, who was a constant companion of mine for upwards of two years, told me that he had been married for many years, and that such was the custom among the people of his tribe, who dwelt beyond Chesterfield Inlet, and, as may be expected, early puberty is equally met with in the male.

This is well borne out by information I have personally obtained from Churchill, a settlement on the West Coast of Hudson's Bay, which the Eskimo often visit for the purposes of trade.

The few foregoing remarks are advanced as an illustration of a fact which I would wish to explain; and in the first place, I may instance local natural causes; as playing a part in influencing this early development among the Indians of Hudson's Bay.

In olden times, before the advent of the missionary and his restraining influence, marriage was, as far as I can learn, a mere form, and ofttimes the possession of a blanket of sufficient amplitude to cover two substituted itself for any rite,—the phrase "married under a blanket" being but another rendering "of taking to wife." And again, it is a common saying throughout the Indian Territory, that a man cannot hunt well until he takes a wife, which verifies itself upon examination; for does not the wife tend the camp, fish, snare rabbits and partridges, cook, and in short almost wholly provide for 'her man,' and so enable him the more fully to occupy his time in hunting the fur-bearing animals? It may be interesting to note here, not only as an evidence of polygamy in these parts, but as an illustration of the foregoing, a remark made to me by an old Indian chief, Beardy, in reference to his poor hunt—"I have done nothing since I became a Christian." The resident missionary had made it a *sine qua non* that he should put away *five* of his wives before he could be baptized—a bitter pill indeed to poor chief Beardy, who had but lately realized the one ambition of his life, to be ahead of his late father in the matter of wives—but for conscience' sake he gave way, kept his youngest, prettiest, and most useless wife, and has since but lived to mourn her incapacity and his perversion.

When it is understood what a helpful mate the Indian woman usually is to her husband, it can be realized that the doctrine of early marriage is inculcated, and indeed considered necessary to the common weal. Touching upon this I will relate an occurrence that took place here, some few years since, inasmuch as it bears upon Indian marriage custom, based on ancient tradition: A young couple were married, and after going around and making a collection, or rather a requisition, started off to the woods for their honey-moon. Whereupon I questioned an old Indian in reference to this, and asked him, if he thought this taking of a holiday after marriage was possibly copied from the white people (though I must say I have never noted it at York Factory, where contracting parties, immediately after the ceremony is over, return all their borrowed finery, and set about their ordinary work, as if nothing unusual had happened). In answer to my question, the old man somewhat indignantly replied "No, no, it was so long ago." Now is it possible to trace some analogy between the origin of our own honey-moon and that of the Indian, and to refer it to a common source "When a man hath taken a new wife, he shall not go out to war, neither shall he be charged with any business; but he shall be free at home one year, and shall cheer up his wife which he has taken."—DEUT. xxiv. 5.

It is some 2200 years ago since Aristotle taught of the dangers of premature wedlock to the woman, and certainly the result of these precocious unions is disastrous to the child; since it is to this, together with other well recognized causes, which I treat of more fully in my "Notes on Diseases among the Indians frequenting York Factory," that I attribute the universal prevalence of scrofula (it may be here noted that Scrofula is equally prevalent in the Tropics), and early development is here indicated as a most marked symptom, for we observe in the Indian babe, among other peculiarities, the long black silky hair at birth, the very early and regular cutting of teeth, though this only holds conversely good as to Darwin's teaching, as he notes the tardy cutting and irregularity of teeth and diseased condition of hair as typical of some tribes of Indians. Again the Indian child walks very early, grows rapidly, and is very precocious generally, as a very natural consequence of this early development; the girl soon merges into the marriageable female, and very shortly the child-wife becomes the child-mother; and this baneful disease is perpetuated. But these natives, like those of tropical climes, age early, according to the laws of compensation, or as Goethe expressed it: "Nature, in order to spend on one side, economised on the other side." And when we examine into the tent life of the Indian, or even the "herding and pigging" in houses around a settlement, it is not difficult to realize, irrespective of physiological causes, why the Indian child should develop early. For they are treated by their parents even as one of themselves, and the very nature of their lives, putting aside all questions of morality, or rather the utter lack of it, again teaches and induces independence, and that independence, thus early taught by their associations and surroundings, bids them to seek a mate, and go forth in their world, "a very sorry pair of phenomena."

With the exception of the fact that the life of the Eskimo is possibly a more healthy oné than that of his Indian brother, the foregoing remarks may equally and perhaps more especially apply to him, and when it is taken into consideration that for some nine months of the year he is breathing an air condensed and supercharged with oxygen, it must directly and indirectly account for his rapid and sturdy growth as a child. Under such circumstances the animal combustion must be necessarily great; still the vital waste is more than retarded by the carbon taken into the system by the draughts of warm blood from recently killed animals, and by the enormous amount of fatty and oily food which he consumes. The continued existence of the Eskimo in the Arctic regions, with a vigour exceeding that of the natives of the Tropics, proves that the human species is independent of temperature, while the equally early development of aborigines under these opposite conditions shows that we must look for its cause in something else than the climate.

We can localize the animal and vegetable kingdoms, but as Agassiz says: "Man alone is complete. His domain is the whole world." Even were this not so, any application of uniformity to man could only be maintained on the principle of double negation, for the Eskimo contrasts with his sub-arctic brother, as the Mongol contrasts with the sub-tropical Asiatic.

In briefly reviewing what I have advanced upon this subject, I cannot, in all deference, think it mere illusion to refer the solution of a phenomenon so essentially identical in nature, affecting alike peoples of diametrically opposed nationalities, temperaments, customs and associations, to other influences than the unconscious operation of local conditions and admit this remarkable fact of precocious development, physically characteristic, as it is, of people of a common descent, to be an intermediate link connecting the two extremes, and to adapt to this higher organization the accepted apophthegm in botany of "species keeping true in either one marked particular or another, although living under most opposite climes."

TWENTIETH MEETING.

Twentieth meeting, 17th April, 1886, the President in the Chair.

The following list of donations and exchanges was read:

1. Report of the Minister of Education (Ontario), 1885.
2. Literary Bulletin of Cornell University, Vol. II., No. 1.
3. Thirty-second Annual Report of the State Historical Society of Wisconsin.
4. Transactions of the American Society of Civil Engineers, February, 1886.
5. Appleton's Literary Bulletin, No. 44.
6. Journal of the Cincinnati Society of Natural History, Vol. IX., No. 1.
7. Proceedings of the American Philosophical Society, Vol. XXIII., Nos. 121, 122.
8. Twenty-third Annual Report of the State Board of Agriculture of Michigan.
9. Annual Report of the Smithsonian Institution for 1883.
10. Proceedings of the Rhode Island Historical Society, 1885-86.
11. Journal of the Trenton Natural History Society, Vol. I., No. 1.
12. Transactions of the Royal Geological Society of Cornwall, Vol. X., Part 8.
13. Transactions of the National Association for the Promotion of Social Science, 1884.
14. The Scottish Geographical Magazine, Vol. II., No. 4.
15. The Midland Naturalist, No. 100.
16. Illustrated Journal of Patented Inventions, No. 62, April 2nd, 1886.
17. Chemical News, April 21, 1886.
18. Transactions of the Royal Scottish Society of Arts, Vol. XI., Part 3. 2 copies.
19. Imperial Federation, Vol. I., No. 4.
20. Memoirs of the Manchester Literary and Philosophical Society, 3rd Series, Vol. VIII. Proceedings of the Manchester Literary and Philosophical Society, Vols. XXIII and XXIV.
21. Electrical Review, April 17th, 1886.
22. Memoirs of the Geological Survey of India, Vol. XXI., Parts 3 and 4; Palæontologia Indica, Series IV., Vol. I., Part 5, Series XIII, Vol. I., Part 4, Fas. 5, Series XIV., Vol. I., Part 3, Fas. 5.
23. Journal of the Proceedings of the Royal Society for New South Wales for 1884, Vol. XVIII.
24. Centenary Review of the Asiatic Society of Bengal from 1784 to 1883. Calcutta.
25. Annales des Ponts et Chaussées, Mémoires et Documents. Personnel, 1886. 6e Sérié 1er Cahier, Janvier, 1886.
26. Boletin de la Sociedad Geográfica de Madrid, Tomo XX., Numero 2°.
27. Cosmos, 29 Mars, 1889.
28. Electricité, 27 Mars, 1886.

29. Wochenschrift des österreichischen Ingenieur und Architekten Vereines. Wien, No. 13, 29 März, 1886.
30. Tijdschrift voor Nijverheid en Landbouw in Nederlandsche Indië, Deel XXXII, Aflevering I.
31. Compte Rendu de la Société de Géographie, No. 7, 1886.
32. Bollettino della Società Geografica Italiana, Serie II., Vol. XI., Fas. 3.
33. Monatsblätter des wissenschaftlichen Club in Wien, VII Jahrgang, No. 6. Ausserordentliche Beilage zu No. 6.
34. Sitzungsberichte und Abhandlungen der Naturwissenschaftlichen Gesellschaft Isis in Dresden, 1885.
35. Compte Rendu des Séances de la Société de Physique et d'Histoire Naturelle de Genève, II, 1885.
36. Archives du Musée Teyler, Ser. II., Vol. II. 2e et 3e Parties, Catalogue de la Bibliothèque 1e et 2e Livraisons.
37. Anales del Museo Nacional de México, Tome III., Entrega 8a, 1885.
38. Bulletin de la Société Royale Belge de Géographie 9e Année, 1885, Nos. 1, 2, 3.
39. Jahrbuch der K.K.Geologischen Reichsanstalt, Jahrgang, 1885, XXVIII. Band, 2 und 3 Heft. Wien.
40. Sitzungsberichte der Naturforschenden Gesellschaft zu Leipzig, II. Jahrgang, 1884.
41. Jahresbericht der Naturhistorischen Gesellschaft zu Nürnberg, 1884.
42. XXVIII., XXIX., XXX., XXXI. Berichte des Vereines für Naturkunde zu Cassel. Catalog der Bibliothek des Vereines für Naturkunde in Cassel, 1875. Repertorium der Landeskundlichen Litteratur.
43. Tijdschrift der Nederlandsche Dierkundige Vereeniging, Deel V., VI., Supplement, Deel I., Aflevering I., II.,, 2de Serie, Deel I., Aflevering I.

Total 66

Mr. Arthur Cox was elected a Member.

On motion by Mr. Houston, seconded by Mr. Browning, it was resolved: "That a Committee composed of Messrs. Notman, Boyle, Shaw, Browning, and the mover be appointed with instructions to ascertain and report what steps have been taken by Governments, Universities, Colleges, and Learned Societies to secure the general introduction of a more simple and phonetic system of spelling English words than the one at present in force."

Mr. Houston said that he had had frequent occasions of presenting his views on this subject in other places. As a rule the scheme of spelling in a more logical and simple manner had been approved of by teachers and others familiar with the subject. The first movement in the direction of a more practical and scientific method of spelling had been made about forty years ago by Messrs. Ellis and Pitman. Since that time much progress had been made. In Spain the subject had been taken up and something done in the matter some time ago. In Germany at the present time efforts were being made to have a spelling reform. In Holland they had reformed their spelling to some extent a number of years ago. In France no steps had been taken in the matter. This reform if carried out would revolutionize the spelling of 10,000 words, or about 5,000 of those constantly used, without greatly changing their appearance.

Mr. Browning in seconding the resolution said he thought that it did not go far enough. He would prefer that the Institute should take a more active part in the matter.

Dr. Cassidy spoke against the reform. He said that he had already gone to the trouble of learning how to spell and did not want to have to learn over again. The change would partake considerably of the grotesque. In reading the works of our great writers we had become familiar with their thoughts presented in a certain style of spelling and associated with the appearance of the words. To change that style would to a great extent mar the effect of the thoughts. He would prefer to see the motion laid on the table.

Mr. Houston replied. He said that the art of acquiring our present mode of spelling was mere drudgery, and the time devoted to it could be more profitably bestowed on far more important subjects.

TWENTY-FIRST MEETING.

Twenty-first meeting, 24th April, 1886, the President in the Chair.

The following list of donations and exchanges was read:

1. **From the Manitoba Historical and Scientific Society:**
   - **(1) Annual Report for 1885-86.**
   - **(2) Transaction 19. The Old Settlers of Red River.**
   - **(3) Transaction 20. Notes on the Geology of some Islands in Lake Winnipeg.**
   - **(4) Transaction 21. Change in Time Marking.**
2. **Monthly Weather Review, March 1886.**

3. Canadian Entomologist, Vol. XVIII., No. 4.
4. Science, Vol. VII., No. 167 and No. 168.
5. Journal of the Trenton Natural History Society, Vol. I., No. 1.
6. Journal of the New York Microscopical Society, Vol. II., No. 2.
7. The Electrical Review, April 24, 1886.
8. Annual Report of the Buffalo Historical Society, January 12, 1886.
9. Proceedings of the American Association for the Advancement of Science. 33rd Meeting, Philadelphia, September, 1884, Parts 1 and II.
10. Proceedings of the Royal Geographical Society, Vol. VIII., No. 4.
11. The Chemical News, April 9, 1886.
12. Monthly Notices of the Royal Astronomical Society, Vol. XLVI., No. 5.
13. (1) Proceedings of the Asiatic Society of Bengal, Nos. IX. and X. November and December, 1885.
    (2) Journal of the Asiatic Society of Bengal, Vol. LIV., Part I., Nos. 3 and 4, 1885; Vol. LIV., Part 2, No. 3, 1885.
14. Geologiska Foreuingens i Stockholm, Forhandlingar. Band VIII., Häfte 1, 2, 3 Januari, Februari, Mars, 1886.
15. Gazetta Chimica Italiana, Anno XVI., Fasc. I, Palermo.
16. Electricité, 3rd and 10th April, 1886.
17. Cosmos, 5th and 12th April, 1886.
18. Programme of the International Competition for Designs for a new Façade to the Cathedral of Milan, with six Illustrations.
19. Annables des Mines, Huitiéme Série Tome VIII., 6^e Livraison de 1885.
20. Historisches Jahrbuch der Görres-Gesellschaft, VII. Band, 2 Heft.
21. Wochenschrift des österreichischen Ingenieur and Architekten Vereines, No. 14 u 15, April 2 and 9, 1886.
22. Archivio per l'Antropologia e la Etnologia, Vol. 15, Fas. 3; Vol. 15, Vol. Fas. 1 e 2, 1885 ; Quadri Statistici, Serie Prusia.
23. Reale Istituto Lombardo di Scienze è Lettere, Reudiconti, Serie II.
24. Boletin de la Sociedade Antropologica de la Isla de Cuba, Tomo 1, Numero 1, 2 3, 4, 5, 6, Habaua.
25. Revista da Secçao da Sociedade de Geographia de Lisboa no Brazil, 2 Serie, No. 3.
26. Società Storica per la Provincia di Como, Fas. 18.
27. Journal des Sociétés Scientifiques, 7 Avril, 1886.
28. Monatliche Mittheilungen des Naturwissenschaftlichen Vereins, Frankfurt a. Oder, 3 July, No. 11, 22, 4 Jahrgang, No. 1.
29. Verhandlungen der Berliner Gesellschaft für Anthropologie, Ethnologie und Urgeschichte, 17 Octr., 1885 ; 25 Octr., 21 Nov. and 19 Dec. Chronologisches Inhaltsverzeichuis der Verhandlungen.
30. Cronica Cientifica, No. 199, 200, Barcelona.

Total 571.

Mr. Thos. B. Speight was elected a member.

Nominations for officers for the ensuing year were then made.

Mr. Roche read a paper on "The Precipitation of Iron in Saline Solutions."

ANNUAL MEETING.

The Thirty-Seventh Annual Meeting was held on Saturday, 1st May, 1886, the President in the chair.

The minutes of the last Annual Meeting were read and confirmed.

The following list of Donations and Exchanges was read :—

1. Le Naturaliste Canadien, Avril, 1886.
2. Report of the Minister of Education (Ontario) for the year 1885.
3. Canadian Record of Science, Vol. II., No. 2
4. Historical Collections of the Essex Institute, Vol. XIII, No. 7, 8, 9, 1885.
5. Bulletin No. 1 of the American Ornithologists' Union.
6. Magazine of American History, May, 1886.
7. The American Naturalist, May, 1886.
8. Electrical Review, May, 1886.
9. American Catholic Quarterly Review, No. 42, April, 1886.
10. Science, Vol. VII., No. 169.
11. School of Mines Quarterly, Vol. VII., No. 3.
12. Journal of Speculative Philosophy, Vol. XIX., No. 4, October, 1885.
13. Journal of the Transactions of the Victoria Institute, Vol. XIX., No. 76.
14. Chemical News, April 16, 1886.
15. Illustrated Journal of Patented Inventions, No. 63, April 16, 1886.
16. Paper and Proceedings of the Royal Society of Tasmania for 1885.
17. Bulletin de la Société d'Anthropologie de Paris, Tome Huitième (III. Série) 4e Fascicule.
18. Verhandlungen der Gesellschaft für Erdkunde zu Berlin, Band XIII, No. 3e
19. Journal de la Société Physico-chimique Russe, Tome XVII
20. Mémoires et Compte Rendu des Travaux de la Société des Ingénieurs Civils, 4e Série, 11e Cahier, November, 1885.
21. Journal des Sociétés Scientifique, 14 Avril, 1886.
22. Compte Rendu de la Société de Géographie de Paris, No. 8.

Messrs. H. B. Spotton, George S. Bean, B. A., Charles Hill Tout and William H. Huston, M.A., were elected members.

Dr. Daniel Wilson read a paper on "Ancient Celtic Art," which has since been published elsewhere.

Mr. VanderSmissen, on behalf of the author, read the following paper :

MARBLE ISLAND AND THE NORTH-WEST COAST OF HUDSON'S BAY.*

BY ROBERT BELL, B.A.Sc., M.D., LL.D.

ASSISTANT DIRECTOR OF THE GEOLOGICAL SURVEY OF CANADA.

Marble Island, in the north-western part of Hudson's Bay, is better known than any other spot in that part of the world, mainly owing to the fact that it has long been the rendezvous of the American whalers who frequent our great inland sea. But it has some very interesting historical associations as well, and its extraordinary appearance has helped to bring it into notice. Although it was first called Marble Island, the name was changed to Brook-Cobham, by Fox, the discoverer of the great Channel which constitutes the north-westward continuation of Hudson's Straits, and which bears his name. However, the original name is now generally adopted.

The island lies about sixteen miles out from the north-western shore of Hudson's Bay, in latitude 60° 40', and between longitude 91° and 92° west. It has a length of about twenty-five miles by a breadth of five or six. The surface has an undulating outline with long, gentle slopes; and its general elevation is a few hundred feet above the sea. The harbour used by the American whalers is situated on the south side and near the west end. It consists of an outer and an inner harbour. The outer one is formed by a small island called Deadman's Island, and from it, a narrow channel, with no great depth of water, which has been cut by nature through a ridge of rocks, leads to the inner harbour, a land-locked basin measuring fully a mile in its greatest diameter.

Perhaps the best way to give an idea of the appearance and characteristic features of Marble Island will be to describe our own impressions on first visiting it during the summer of 1884 by the S.S. *Neptune*. No one connected with the expedition had been in this quarter before. At the time when we were nearing this side of the bay, we had lost our reckoning owing to thick weather, and although

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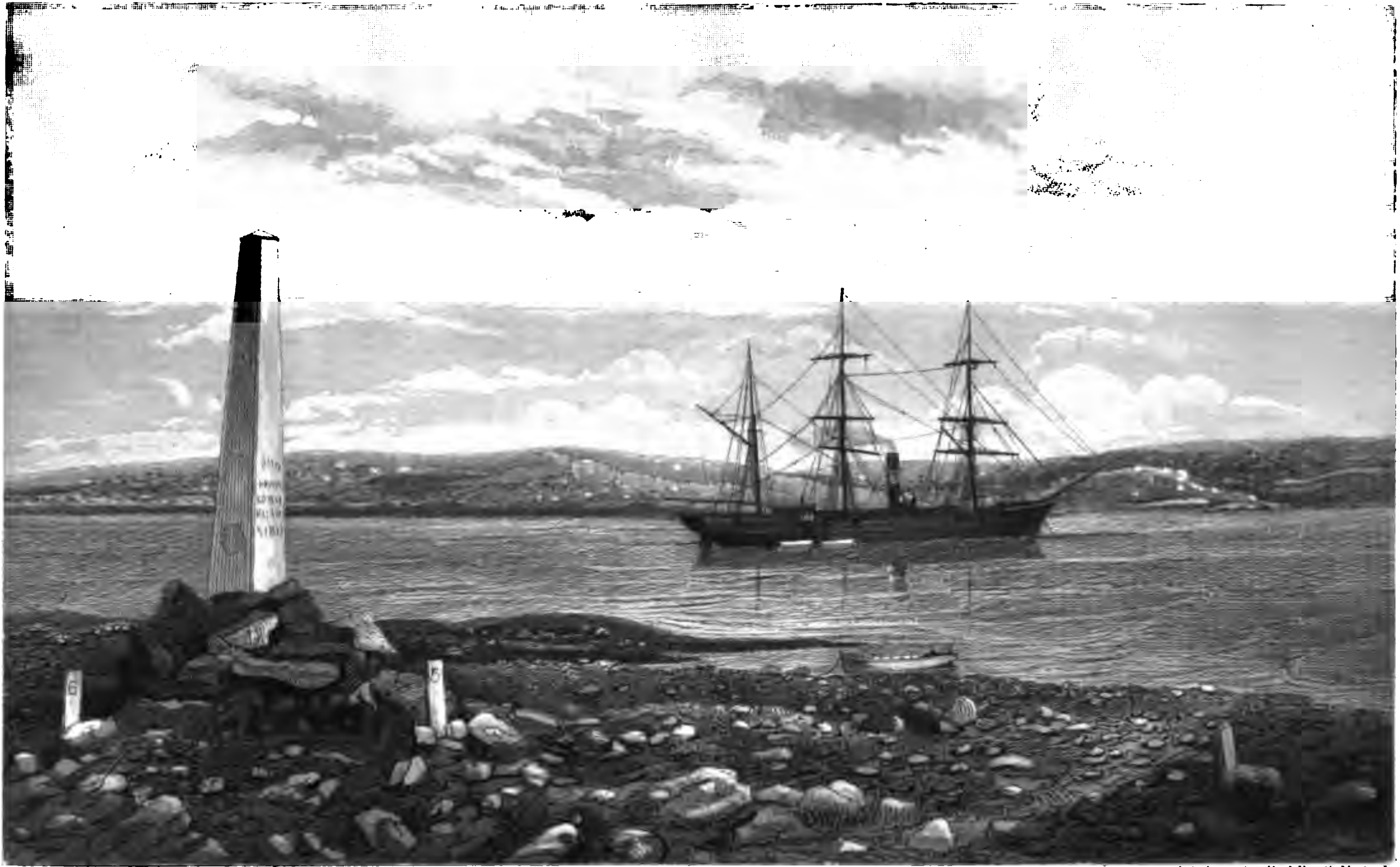
* The illustration accompanying this paper is inserted by the kind permission of Dr. Alfred R. C. Selwyn, C.M.G., F.R.S., Director of the Geological and Natural History Survey of Canada, as is also the illustration accompanying Mr. Stupart's paper in this volume on "The Eskimo of Stupart's Bay.



Dr R. BELL, PHOTO.

British American Bank Note Co. Montreal

VIEW OF MARBLE ISLAND FROM DEADMAN'S ISLAND.

we happened to be going straight towards the island, none of us at first recognized it on account of the very singular appearance which it presented. All the other shores we had been visiting looked nearly black, but we had also become accustomed to plenty of whiteness in the form of snow, ice and fog-banks. On approaching it in the early morning, at first sight we naturally supposed, from its extent and whiteness, that what we saw before us must be one of these objects; but still, on closer observation, it did not correspond with any of them in shape or other characters. It was too large for an ice-berg (even if there were any in Hudson's Bay, which is not the case), too stationary in position and outline for a fog-bank, and too high for field-ice. Then the extraordinary dark lines and patches which we saw here and there, puzzled us very much. As we drew nearer to it, however, we concluded it must be the far-famed Marble Island, but we had not anticipated seeing such a gigantic mass of marble; and its clean, smooth, white appearance was as wonderful as its extent, for the weathered surface of marble is seldom smooth and white. When within a short distance of the shore, the morning sun shone out and the gorgeous appearance of the steep slopes of pure white rock, washed by the bright sea, with screaming gulls sailing about in the air, was beautiful in the extreme. On entering the harbour behind Deadman's Island, the evidences of the work of civilized man which met the eye, were in singular contrast to the monotony of nature in these desolate regions of the north. A bank of shingle, rising a few feet above the spring tides, forms the highest part of the island. Along this ridge is a row of recently erected white monuments, which stand out in bold relief. Some of them are high columns, but the majority resemble ordinary headstones. They looked like white marble, and where this material was so abundant, it was natural to suppose that they had been formed from it. But appearances, as well as names, are sometimes very deceptive. On going ashore, we found the marble monuments and headstones only painted wood and the marble hills solid white quartzite, as hard as flint. But in spite of the fact that this rock proved to be something very different from white marble, yet even on close inspection, every detail in its appearance was still that of marble. All the most beautiful varieties were there—the pure white, dove-colored, veined, mottled and streaked, lovely lilac and pink, and delicate tints of green and rose color and many other shades, which would charm the most æsthetic eye.

Around both harbours we noticed various discarded articles which had been used in the whale-fishery, and in two or three places on the steep walls of rock overlooking the inner basin were painted lists of the names of many men whose bones are buried among the gravel near by. These, as well as the poor fellows who lie under the wooden monuments of Deadman's Island outside, were seamen and whalers who had died of scurvy, consumption, and other diseases, or from accidents and shipwreck in prosecuting the whale-fishery. The short notes accompanying some of their names suggest many a pathetic history of brave and adventurous men who had gone to these northern waters to earn, by honest toil, the means of bettering their condition. No doubt they must have endured great sufferings from sickness, cold, hunger and pain, during the dark days of the long dreary winter before they died a miserable death, unseen by any, save their equally miserable companions.

In carrying on the whale-fishery around Marble Island the American captains call to their assistance the Eskimos of that region, who are willing and industrious workers, already trained to the business; but it is said they receive very little remuneration for their services. The black whale is stated to be the commonest species taken, but other kinds are met with. In addition to killing the larger whales, our neighbours are reported to collect from the natives considerable quantities of the oil or blubber of the small white whale, the walrus, the narwhal, the polar bear and various kinds of seals. As Hudson's "Bay" is really an inland sea of the Dominion, it is questionable if this business may not be a violation of our treaty rights. The Russian government is understood to exact a very heavy license fee from vessels whaling in the White Sea, which is by no means so land-locked as the Canadian Mediterranean. In this matter we may be allowing a source of revenue to go unimproved.

The Whalers' Harbour in Marble Island is an excellent place for ballasting ships. The beach is steep, so that boats can lie against it at all stages of the tide, and it is almost everywhere covered with small boulders or coarse shingle derived from the white quartzite. While the *Neptune* was lying here the captain availed himself of these advantages and took in a large quantity of ballast to compensate for the weight of fuel we had burnt. When the voyage was over, the vessel went to Sydney for coal, and here these beautifully white rounded stones from Hudson's Bay, which were now put ashore, attracted considerable attention and were much admired.

Marble Island and the mainland opposite are entirely destitute of timber, which, near the coast, does not extend further north than Seal River, 280 statute miles to the south. From Seal River, the northern limit of the forest, which at the verge consists of only small spruce and tamarac, runs in a north-westerly course almost directly to the mouth of the Mackenzie River, thus leaving two or three hundred miles of the Barren Grounds between this line and the coast opposite to Marble Island.

Although no trees grow on the island, there is an abundance of sub-arctic vegetation. The large ponds or small lakes among the hills in the interior are encircled with green, and they have become the breeding places of swans, arctic and red-throated divers, and other water-fowl. Many species of smaller birds were noticed, and owing to the open nature of the country they probably fall an easy prey to the peregrine falcon which also breeds on the island. The reindeer, or barren-ground carriboo, and the musk-ox, are found on the mainland opposite, which is the southern limit, on the coast, of the latter animal, but it ranges further south in the interior.

The American whalers and others constantly speak of Marble Island as if it were really composed of marble. Although I had not an opportunity of personally examining it before 1884, I had long been aware that the white rock of this island was quartzite, having received specimens of it through friends in the Hudson's Bay Company's service. It appears to be identical with the quartzites of the Huronian series, so largely developed on the north shore of Lake Huron between Killarney and the Spanish River. The Marble Island quartzite must have a very great thickness, and it is unlikely that this is the only locality in the region where similar rocks occur. Indeed we have statements from both Hudson's Bay Company's officers and Indians that similar white rocks are found in abundance on the mainland opposite, and at various places for a long way into the interior in a south-western direction. I have obtained a specimen of quartzite of a light or delicate pink color, said to have been broken from the rock *in situ* on the south side of Nevil Bay, about 150 miles south-westward of Marble Island. Continuing the same course inland, white rocks are reported as occurring around White Rabbit Lake, between Nevil Bay and Hatchet or Wollaston

Lake, and boulders of white quartzite are very numerous at the Methy or Long Portage, still further to the south-west.

Our visit to Marble Island was so short that I had only time to examine the western part, the whole of which consisted of different varieties of light-colored quartzites. The rocks being free from lichens or staining, both the shores and the hills in the interior have a uniform white appearance, which might be taken for that of snow, but for the strong contrast due to the dark brown of the peaty depressions. The stratification is usually very massive. Ripple-marks, varying from coarse and wide to fine and narrow, were observed on the surfaces of many of the beds, especially the thinner ones.

Near the south-western point of the island the quartzite presents beautiful lilac colors of various shades. Here the direction of the dip is N. 5° E., *true* (the magnetic variation being 5° W.), and the inclination 80° from the horizontal plane. At the north-western point the direction of the dip is N. 80° W., *true*, and the inclination 45°. This is also the prevailing direction and angle in the interior of the west end of the island. But on the north shore, opposite the harbour on the south side, the direction is N. 65° W., *true.*, and the inclination 40°. It will thus be seen that the strike of the bedding varies considerably in different places. It was further observed that although the general course of the rocks might be tolerably straight locally, the lines of stratification undulated a good deal, the minor sinuosities appearing on smooth sections as mere corrugations of the lamination.

On Deadman's Island, the white quartzites pass into grey, and these rocks are associated with a dark glossy micaceous schist, all striking N. 80° W., *true*, or dipping N. 10° E., at an angle of 90°.

In the course of my examination of Marble Island, I observed the debris of a variety of Huronian rocks, including the brown-weathering dolomite of that series, strewn upon the surface, from which it was inferred that these rocks would be found *in situ* at no great distance in the direction from which the drift had come. Since my visit to the island I have received from a friend a most interesting collection of lithological specimens, representing the fixed rocks of the coast from Chesterfield Inlet south-westward to Eskimo Point (where the rocky shore terminates), embracing a distance of about 180 statute miles in a straight line. They include a considerable variety of species, and from them it is manifest that the Huronian series is well developed and occupies a large area on the north-west side of Hudson's Bay. This would be a highly important fact, even if the collection referred to contained no direct evidence of the existence there of economic minerals, because we already know, from an extensive examination of these rocks in other parts of the Dominion, that they constitute the repositories of numerous metallic ores and other useful minerals, while the primitive Laurentian rocks are almost destitute of them. But in this collection there are eleven specimens of granular iron pyrites, from different parts of this coast, all of which apparently contain small quartz grains. Most of the specimens are angular, and their aggregate weight is about fifty pounds. Mr. Hoffmann, chemist to the Geological Survey, has made an assay of one of these specimens from a bay south of Cape Jones, which forms the southern horn of Rankin Inlet, and found it to contain traces of both gold and silver. A good sized angular piece of similar pyrites, which I obtained from the Eskimos in 1879, and which they brought from a place called Iñari, described as being about two-thirds of the distance from Churchill Harbour to Marble Island, had a small quantity of light bluish-grey magnesian limestone adhering to it. Some of the other specimens of this pyrites have small pieces of soft dark-greenish schist attached to them.

The specimens from the above-mentioned 180 miles of the north-west shore of Hudson's Bay embrace the following rocks: Chloritic schist, dark cherty schist, hard dark argillaceous slate, finely ribboned hornblende and quartz schist, imperfect gneiss, dark silicious breccia with calcspar, dark-green crystalline pyroxene rock, dark chocolate-coloured silicious argillite with conchoidal fracture, calcspar veinstones, semi-translucent white quartz, red aplite of medium texture, rather fine-grained grey granite, grey diorite, consisting of light-coloured felspar and dark hornblende in small distinct crystals, giving it an even and finely speckled appearance, fine-grained hornblende schists, greenstones, quartz and epidote rock, light grey coarse grained sandstone altered to quartzite and holding fragments of indurated red shale, compact banded white quartz-rock with crystals of iron pyrites in some of the layers, light quartzite like that of Marble Island, grey felsites, crystalline hornblende-rock, diorite, consisting of compact white felspar with long crystals of dark hornblende, banded grey hornblende and quartz-rock with some layers approaching chert, mica schists of different kinds, mixed hornblende and mica-schist, chocolate-coloured porphyry with flesh-coloured crystals of felspar and grains of clear quartz, granulite, red jasper with dull fracture, hard brownish-red sandstone, grey felsitic quartzite with lenticular patches of dark mica-schist, chloritic schist, the granular iron pyrites associated with dark-greenish schist above referred to, several hundreds of cubes of iron pyrites, mostly small, taken from a dark glossy schist, quartz veinstone with large scales of light-coloured mica together with garnets, calcspar veinstone with embedded crystals of quartz and having grey steatitic rock adhering to it, also a veinstone of quartz containing silky radiating aggregates of hornblende and a few specks of calcspar and iron pyrites; some greenish schist is attached to this specimen. A loose piece of brown-weathering dolomite with reticulating strings of white quartz was found on Marble Island.

The granular quartziferous iron pyrites of this collection bears a strong resemblance to that of the mines at Capelton, in the Township of Ascot, Province of Quebec, and to that of the more cupriferous pyrites of the Tilt Cove Mine in Newfoundland, as also to the equally rich copper-bearing pyrites more recently discovered among the Huronian rocks at Sudbury, in the Province of Ontario. The specimen of pyrites from Iñari did not show the presence of copper, but elsewhere in working pyrites veins it has been observed that although this metal may be present only in small quantities at the surface, the proportion increases rapidly in going downward.

The resemblance between the pyrites of the three localities above mentioned is interesting, not only from an economical, but also from a geological point of view, especially in connection with the question of equivalency in age, or otherwise, of the different sets of rocks in which they are found.

At the south-west point of Marble Island, large green stains of carbonate of copper occur on the surface of the quartzite, some of them being three or four feet in diameter. They are probably due to the decomposition of sulphide of copper in the rock.

In 1850, James Tennant, Esq., Professor of Mineralogy, in King's College, London, examined seven rock-specimens which had been brought from the north point of Rankin Inlet, directly opposite to and in sight of the west end of Marble Island, and among them he mentions "quartz, enclosing chlorite and copper-pyrites; carbonate and silicate of copper, with copper-pyrites on argillaceous slate; ditto, with a thin coating of green carbonate of copper."

Judging from what Professor Tennant says as to a few rock-specimens which were submitted to him from Repulse Bay and vicinity, 300 miles northeastward of Marble Island, the Huronian rocks would appear to occur there also. One specimen from this bay, he describes as "quartz coloured bv oxide of iron and containing minute particles of gold." The existence of visible gold in quartz at Repulse Bay is an important fact. It has been already mentioned that gold and silver were found by assay in a specimen of iron pyrites from a bay south of Cape Jones, not far south-west of Marble Island. Both gold and silver have been discovered by assay in specimens of quartz or pyrites which I have brought from various parts of Hudson's Bay and Straits. In 1877, Dr. Harrington. who was then chemist to the Geological Survey, detected both gold and silver in iron pyrites which I had collected from a small vein cutting gneiss on a point about one mile south of the mouth of Great Whale River, and also in pyrites from veins in the dolomite which forms Dog Island, close to the main shore, a few miles north of the Cape Jones of the East-main coast. The galena of the old mine, about three miles north-east of Little Whale River trading post, was found to contain 5·104 ounces of silver to the ton of 2,000 lbs., and that from the south side of the inlet of Richmond Gulf, 12·03 ounces to the same quantity of ore. More recently, Mr. Hoffmann, now chemist to the Survey, has found small quantities of gold and silver in quartz which I obtained from a thin vein on one of the Ottawa Islands, in the north-eastern part of Hudson's Bay. He has also proved the occurrence of the precious metals in quartz veinstones, which I brought from Cape Prince of Wales, about the middle of the south side of Hudson's Straits; Cape Chudleigh, on the south side of the eastern entrance to the Straits; and Nachvak Inlet, on the Labrador coast, about 140 miles south of the last mentioned cape.

From the data I have gathered at Marble Island and that afforded by the valuable series of specimens which I have referred to, as well as from the fact that Laurentian types of rocks are absent from the collections, it is to be inferred, as already stated, that we have a great development of the Huronian series along the 180 miles of coast from Chesterfield Inlet to Eskimo Point, both in regard to the variety of the rocks themselves and their geographical extent. The information afforded by the materials of the drift and that derived from the other sources I have alluded to, all indicate that these rocks likewise occupy a very large area of country extending inland from this part of the coast. This unexplored region would, no doubt, prove a highly interesting field for research both to the geologist and the miner.

In my various reports on Hudson's Bay and Straits, I have had occasion to refer to the indications everywhere to be met with, of the great changes which have taken place in the relative levels of the sea and land in comparatively recent geological times. Similar phenomena have been observed in Baffin Land and on the northern shores of the American continent, as well as on all the islands north of the mainland, by the officers of the numerous Franklin search expeditions, and other explorers. This change in the relative levels of the land and water has not, therefore, been limited to "an area of upheaval," but has been general in all these northern regions of the earth.

The evidence of the rapid rise of the land, or perhaps more correctly speaking, of the recession of the sea, is strikingly manifested on Marble Island. The smooth pebbles and rounded stones of the ancient beaches, being snowy white, the horizontal lines of the latter are rendered conspicuous in the naked landscapes by their contrast with the yellowish-grey or brown color of the vegetable matter which occupies the intervals between them. They occur at numerous different levels, up to 200 or 300 feet, and some at still greater elevations.

The solid rocks of Marble Island are pretty thoroughly glaciated and the striæ are very distinct. At the north-west point of the island their course is S. 25° E. *true*, and on Deadman's Island it is S. 15° E. *true*. It may be mentioned in connection with this subject that at Fort Churchill the course of the glacial striæ is S.S.W., and at the first solid rock seen in ascending the Hayes River it is S.S.E., with an older set at the same place, running nearly east and west. To the west and south of James' Bay the general course is south-westward; along the southern part of the East-main coast, westward, and toward the northern part of this coast, northward; while in Hudson's Straits it is eastward. From these facts it might be inferred that during the glacial period, the ice which formed in the basin of Hudson's Bay, or flowed into it from the high lands to the north-west and those of the Labrador peninsula to the east, found outlets towards the south and south-west, and also to the north-eastward into Hudson's Straits. The glacial debris, found all around the Bay and in the Straits, has been transported in directions corresponding with this view of the general conditions during the drift period.

At the east end of Marble Island there is a bay or harbour, with which a very sad history is associated ; and as the events connected with it form an interesting chapter in the progress of discovery in these parts, I may be here allowed to devote a little space to the subject. When the Hudson's Bay Company first established a trading post at the Churchill River, in 1715, the Indians who ranged over the Barren Grounds to the westward of Marble Island frequently brought samples of native copper to the settlement, and stated that they were found near a large river, which afterwards proved to be the Coppermine, flowing into the Arctic Sea. At that time, however, the Company's people believed the river referred to emptied into Hudson's Bay, as they did not suppose these savages could wander or trade as far as a great river discharging into another sea. In addition to this pure copper, it was supposed that "gold and other valuable commodities" were to be found "to the northward." To prove this and to discover the North-west Passage, the Company, in 1719, sent out two vessels, the *Albany* frigate, George Barlow, master, and the sloop *Discovery*, David Vaughan, master, under the command of Mr. James Knight, "who had been many years governor at the different factories in the Bay, and who had made the first settlement at Churchill River."

Mr. Knight was then nearly eighty years of age, but nevertheless he appears to have been full of enthusiasm ; and Hearne says "he was so prepossessed of his success and of the great advantage that would arise from his discoveries, that he procured and took with him some large iron-bound chests to hold gold-dust and other valuables which he fondly flattered himself were to be found in these parts."

Neither of the vessels having returned to England, and the Company feeling alarm for their welfare, in 1722 a sloop called the *Whalebone*, John Scroggs, master, was sent from Churchill in search of them, but he returned the same season without having ascertained anything definite as to the whereabouts of the vessels.

The story of the unhappy termination of this expedition is graphically told by Samuel Hearne in the account of his "Journey from

Fort Prince of Wales to the Northern Ocean, in 1769 to 1772," and as it is not long, I shall quote what he says:—

"The strong opinion which then prevailed in Europe respecting the probability of a North-west passage by the way of Hudson's Bay, made many conjecture that Messrs. Knight and Barlow had found a passage and had gone through it into the South Sea by the way of California. Many years elapsed without any other convincing proof to the contrary, except that Middleton, Ellis, Bean, Christopher and Johnson had not been able to find any such passage. And notwithstanding a sloop was annually sent to the northward on discovery and to trade with the Eskimos, it was the summer of 1767 (forty-eight years) before we had positive proofs that poor Mr. Knight and Captain Barlow had been lost in Hudson's Bay.

"The Company were now carrying on a black-whale fishery and Marble Island was made the place of rendezvous, not only on account of the commodiousness of the harbour, but because it had been observed that the whales were more plentiful about that island than on any other part of the coast. This being the case, the boats, when on the lookout for fish, had frequent occasion to row close to the land, by which means they discovered a new harbour near the east end of it, at the head of which they found guns, anchors, cables, bricks, a smith's anvil and many other articles, which the hand of time had not defaced, and which, being of no use to the natives, or too heavy to be removed by them, had not been taken from the place in which they were originally laid. The remains of the house, though pulled to pieces by the Eskimos for the wood and iron, are yet very plain to be seen, as also the hulls, or more properly speaking, the bottoms of the ship and sloop, which lie sunk in about five fathoms of water, toward head of the harbour. The figure-head of the ship, and also the guns, &c., were sent home to the Company, and are certain proofs that Messrs. Knight and Barlow had been lost on that inhospitable island, where neither stick nor stump was to be seen, and which lies sixteen miles from the mainland. Indeed, the main is little better, being a jumble of barren hills and rocks, destitute of every kind of herbage except moss and grass, and at that part, the woods are several hundreds of miles from the sea-side.

"In the summer of 1769, while we were prosecuting the fishery, we saw several Eskimos at this new harbour, and perceiving that one or two of them were greatly advanced in years, our curiosity was excited to ask them some questions concerning the above ship and sloop, which we were the better enabled to do by the assistance of an Eskimo, who was then in the Company's service as a linguist, and annually sailed in one of their vessels in that character. The account which we received from them was full, clear and unreserved, and the sum of it was to the following purport:

"When the vessels arrived at this place (Marble Island), it was very late in the fall, and in getting them into the harbour, the largest received much damage; but on being fairly in, the English began to build the house, their number at that time seeming to be about fifty. As soon as the ice permitted in the following summer (1720), the Eskimos paid them another visit, by which time the number of the English was greatly reduced, and those that were living, seemed very unhealthy. According to the account given by the Eskimos, they were then very busily employed, but about what, they could not easily describe, probably in lengthening the long-boat, for at a little distance from the house there is now lying a great quantity of oak chips, which have been most assuredly made by carpenters.

"Sickness and famine occasioned such havoc among the English that by the setting in of the second winter their number was reduced to twenty. That winter (1720) some of the Eskimos took up their abode on the opposite side of the harbour to that on which the English had built their houses, and frequently supplied them with such provisions as they had, which chiefly consisted of whales' blubber and seals' flesh and train oil. (I, Hearne, have seen the remains of those houses several times; they are on the west side of the harbour and in all probability will be discernable for many years to come). When the spring advanced, the Eskimos went to the continent, and on their visiting Marble Island again in the summer of 1721, they found five of the English alive, and those were in such distress for provisions that they eagerly ate the seals' flesh and whales' blubber quite raw, as they purchased it from the natives. This disordered them so much that three of them died in a few days, and the other two, though very weak, made a shift to bury them. Those two survived many days after the rest and frequently went to the top of an adjacent rock and looked earnestly to the south and east, as if in expectation of some vessel coming to their relief. After continuing there a considerable time together, and nothing appearing in sight, they sat down close together and wept bitterly. At length one of the two died and the other's strength was so far exhausted, that he fell down and died also in attempting to dig a grave for his companion. The skulls and other large bones of those two men are now lying above ground, close to the house. The longest liver was, according to the Eskimo account, always employed in working of iron into implements for them ; probably he was the armourer or smith."

The Annual Report was read and adopted as follows:

ANNUAL REPORT.

SESSION 1885-86.

The Council of the Canadian Institute have the honour to lay before the members their 37th Annual Report.

The most noteworthy event in the history of the Institute during the past year has been the formation of a Biological Section and the incorporation into the Institute of the Natural History Society of Toronto. The alterations in the regulations rendered necessary by the change come into force for the first time at this meeting. It is to be hoped that the Union now consummated will prove of benefit to all those interested in it.

An earnest effort has been made during the year to awaken public interest in the subject of local archæology—the study of the records, now so quickly being obliterated, of the aboriginal races of this country. It is much to be desired that the Provincial Government will see their way to assist in some manner this important object.

We have lost during the past year by withdrawals and deaths 37 members, among whom is our lamented former President, Mr. J. M. Buchan, whose untimely death last summer fell on us with startling suddenness. During the year 26 new members have been elected; so that we now number on our roll 233 members, 11 less than last year. In this connection it seems proper to call attention to the large number of gentlemen who, after permitting themselves to be nominated and elected members of the Institute, have apparently performed no other function in connection with our body. On examining the statistics of the past three or four years, it appears that nearly one-third of these gentlemen elected as members never really became such.

With regard to the list of exchanges it will be seen that the number has been doubled during the past year, and is now five times what it was four years ago.

All of which is respectfully submitted.

(Signed) W. H. ELLIS, *President.*

JAMES BAIN, Jr., *Secretary.*

APPENDIX I.

MEMBERSHIP.

Number of Members, April 1st, 1885	244
Withdrawals and Deaths during the year	37
	207
Elected during the Session, 1885-86	26
Total Members	233
Composed of :	
Honorary Members	5
Life Members	15
Ordinary Members	213
Total	233

APPENDIX II.

TREASURER IN ACCOUNT WITH THE CANADIAN INSTITUTE—SESSION OF 1885-6.

To Summary :	
" Balance on hand	$ 23 63
" Annual Subscriptions	584 00
" Rents	285 00
" Journals sold	2 51
" Books and Periodicals sold	41 65
" Interest on Deposits	1 30
" Government Grant	750 00
	$1,688 09

By Summary :

" Salaries		$344 00
" Periodicals		69 90
" Interest on Mortgage		238 78
" Printing		593 84
" Fuel		94 00
" Gas		43 57
" Water		24 00
" Postage, Post Cards and Delivering Proceedings		117 01
" Express charges		19 04
" Stationery		12 07
" Caretaker		10 00
" Taxes		11 07
" Discount on Cheque		25
" D. Boyle for Specimens		15 00
" Refreshments (opening night)		13 00
" Repairs		19 51
" Balance on hand, cash	24 74	
" in bank	38 31	63 05
		$1,688 09

Examined and found correct.
Signed

W. HENDERSON,
T. B. BROWNING, } Auditors.

ASSETS.

Building	$11,000 00
Warehouse	720 00
Ground	2,500 00
Library	6,100 00
Specimens	1,300 00
Personal Property	500 00
	$22,120 00

LIABILITIES.

Mortgage	$ 3,411 00
Balance in favor of Institute	18,709 00
	$22,120 00

APPENDIX III.

DONATIONS AND EXCHANGES—BOOKS AND PAMPHLETS RECEIVED FROM APRIL 1ST, 1885, TO APRIL 1ST, 1886, AS COMPARED WITH THE THREE PRECEDING YEARS.

	1882-83	1883-84	1884-85	1885-86
Canada	30	90	110	129
United States	60	300	200	510
Great Britain and Ireland	100	200	160	344
India and Australasia	20	40	80	30
Foreign	70	170	180	489
Total	280	800	730	1502

APPENDIX IV.

The number of Societies and Publications with which the Institute now exchanges is 328, shewing an increase of 168 during the year. They may be classified as follows :—

From	Exchanges
Canada	20
United States	97
Mexico	
Island of Cuba	1
South America	4
England	36
Scotland	11
Ireland	6
Austria-Hungary	15
Belgium	4
Denmark	4
France	26
Algeria	1
Germany	32
Iceland	1
Italy	19
Netherlands	8
Norway	5
Portugal	1
Russia	4
Spain	4
Sweden	8

Switzerland	5
Turkey	1
Japan	3
Java	2
India	3
Australia	4
New Zealand	1
Tasmania	1
Total	328

APPENDIX V.

The number of Volumes bound during the year, including a set of the JOURNAL sent to the Colonial Exhibition, 124.

APPENDIX VI.

The number of Books and Periodicals issued to members, 1885-86. 1,129.

APPENDIX VII.

The Periodicals subscribed for are the same as last year.

APPENDIX VIII.

REPORT OF CURATOR FOR 1885-86.

In the additions made to the Institute during my term of office, specimens illustrative of aboriginal and pioneer life occupy the first place.

In April, 1885, with the consent of the Council, I prepared a circular, of which about one thousand copies were addressed to representative men of all classes throughout the Province, asking for information relative to localities connected with prehistoric and early historic events, and requesting persons in possession of relics to forward them to the Institute for the purpose of enabling us to form an archæological exhibit worthy of the Province of Ontario.

In reply to that circular a large quantity of exceedingly valuable information has been collected relating to ancient village sites, battle grounds, portages, etc., and to persons in whose hands there are private collections of more or less value.

In company with other members of the Institute, as well as alone, I visited a few of the places within easy reach of the city, and was enabled to add several hundred excellent specimens to our collection.

A number of gentlemen also who had small collections kindly presented them to the Institute, and, by an arrangement made with the York Pioneers, our Society became custodian of a large number of Indian and other specimens which are now in our cases.

Owing to the rapid expansion of our knowledge as to a number of places that are worthy of examination and survey, as well as because of the many objects we have discovered in the hands of collectors, it is to be deplored that our lack of funds precludes us from proceeding in a systematic and scientific manner in the formation of an archæological museum that would ultimately prove valuable to the Canadian student, and it is to be regretted that the Provincial Legislature failed to respond to our application for assistance in the prosecution of this national work.

The following is a list of the specimens that have been secured during the year, and which are now in cases supplied by the Institute at a cost of $100. The cases have an area of 100 square feet and contain :—

104 Pipe Heads and Stems.
92 Fragments of Pottery.
3 Clay Cups.
4 War Clubs.
18 Strings of Beads.
200 Loose Stone, Bone and Shell Beads.
8 Small Stone Disks—Perforated.
13 Perforated Stone Tablets.
19 Pieces of Shell.
1 Piece Carved Bone.
1 Small Animal—Stone Carving.
2 Horn Gouges.
1 Piece of perforated Horn.
1 Complete Turtle Shell.
1 Perforated "
1 Piece of Human Skull, perforated.
5 Skulls, almost perfect.
1 String of Bone Beads.
44 Bone Needles.
460 Arrow Heads—(flint).
7 " mounted (iron).

121 Stone Axes, Gouges and Chisels.
9 Pieces of Sheet Copper.
1 Whole Copper Kettle.
12 Iron Knives—rusted and worn.
9 Indian Ornaments (various.)
3 " Medals (silver.)
6 Brass and Copper Rings.
14 Iron Tomahawks.

Besides these there are several articles of a miscellaneous kind—the whole numbering fully one thousand.

The principal contributors were:—

Rev. T. T. Johnston, of Ancaster.
Mr. A. F. Hunter, Flos.
Mr. Loughead, Sunnidale.
Mr. B. Jackes, Toronto.
Mr. A. Elvins, "
Mr. A. McKnight, Kirkwall.
Mr. James Rae, "
Mr. James Dwyer, Beverley.
Mr. George E. Laidlaw, The Fort.
Mr. J. Long, Eglinton.
Mr. J. Welbone, Myrtle, and
The Curator.

There are many fine geological specimens that ought to be attended to immediately, but with which it is impossible to do anything for the want of case room.

Before the close of another year it may be reasonably hoped that the whole collection in possession of the Institute will be put in proper shape for study.

All of which is respectfully submitted.

DAVID BOYLE, Ph.B., *Curator.*

On motion of Mr. Keys, seconded by Mr. Kerr, the report was adopted.

The following gentlemen were elected officers for the ensuing year:—

PRESIDENT—W. H. VanderSmissen, M.A.
VICE-PRESIDENT—E. A. Meredith, LL.D.

SECRETARY—Alan Macdougall, M. Inst. C.E., F.R.S.E.
TREASURER—James Bain, jun., Esq.
EDITOR—George Kennedy, M.A., LL.D.
LIBRARIAN—G. E. Shaw, B.A.
CURATOR—David Boyle, Ph. B.

MEMBERS OF COUNCIL
R. Ramsay Wright, M.A., B.Sc., F.R.S.C.
James Loudon, M.A.
W. H. Ellis, M.A., M.B.
D. Wilson, LL.D., F.R S.E., F.R.S.C.
P. H. Bryce, M.D.
Alex. Marling, LL.B.

THE FOOD PLANTS OF PLATYSAMIA CECROPIA.

BY WM. BRODIE.

(Read before the Natural History Society of Toronto.)

In December, 1880, I read a paper before the Natural History Society on the food plants of *Platysamia cecropia.* The paper was a synopsis of observations extending over 17 years, made in the County of York and contained a list of 49 species. This list was afterwards published in the February number of "Papilio" for 1882.

To this list I have made several rather important additions which are included in the following revised list :—

MAGNOLIACEÆ.

Liriodendron tedipifera, L.

LILIACEÆ.

Lilia Americana, L.
" Europæa, L.

SAPINDACEÆ.

Staphylia trifolia, L. in W. Lean's orchard.
Aesculus hippocastanum, L.
Acer Pennsylvanicum, L., Muskoka.
" spicatum, Lam.
" saccharinum, Wang.
" dasycarpum, Ehr.
" rubrum, L.
Negundo aceroides, Moench.

ROSACEÆ.

Persica vulgaris, D.C.
Prunus Americana, Mar.
Prunus domestica, L.
" pumila L., Harbor Island, Georgian Bay.
" Pennslyvanica, L.
" Serotina, Ehr.
" Virginiana, L.
Cerasus vulgaris, L.
Spiræa opulifolia, L.
" salicifolia, L.
" tomentosa, L.
Cratægus coccinea, L.
" tomentosa, L.
" cruxgalli, L.
Pyrus malus, L.
" communis, L.
" coronaria, L.
" arbutifolia, L.
" Americana, s.c.
" acuparia, Gaer.
Amalanchier Canadensis, Torr, Gray.

SAXIFRAGACEÆ.

Ribes lacustre, Poir. Tobermorey.
“ floridum, L.
“ floridum officinale, L.
“ rubrum officinale, L.
“ Aureum, Pursh.

CAPRIFOLIACEÆ.

Symphoricarpus vulgaris, Mich.
Diervilla trifida, Moench.
Sambucus Canadensis, L.
“ pubens, Michx.

COMPOSITÆ.

Lappa officinalis, Alli.

OLEACEÆ.

Fraxinus Americana, L.

URTICACEÆ.

Ulmus fulva, Michx.
“ Americana, L.
“ racemosa, Thorn.

JUGLANDACEÆ.

Carya tomentosa, Nutt.
“ porcina, Nutt.
“ alba, Nutt.

CUPULIFERÆ.

Quercus alba, L.
“ macrocarpa, Michx.
Quercus obtusiloba, Michx.
Castanea vesca, L.
Fagus ferruginea, Ait.
Corylus Americana, Walt.
“ rostrata, Ait.
Ostrya virginica, Willd.
Carpinus Americana, Michx.

BETULACEÆ.

Betula excelsa, L.
“ lenta, L.
“ lutea, Michx.
“ alba, Spach.
“ papyracea, Ait.
“ glandulosa, Michx., Tobermorey
Alnus viridis, D.C., Manitoulin.
“ incana, Willd.
“ serrulata, Ait.

SALICACEÆ.

Salix humilis, Mar.
“ sericea, Mar.
“ viminalis, L.
“ lucida, Mühl.
“ alba, L.
Populus tremuloides, Michx.
“ grandidentata, Michx.
“ balsamifera, L.

On the morning of June 5th, 1885, I found eight Cecropia larvæ, just out of the egg, in one of my breeding boxes. I immediately placed them on a plant of burdock which was growing in the garden. About two weeks afterwards I was somewhat surprised to find four larvæ feeding on the leaves, and from a rather peculiar shade of color I at first took them to be *C. promethea.* From this time I watched them closely; when about half-grown, one left the plant and was lost, the remaining three reached a fair average size, and two when mature left the plant to spin up elsewhere, and were lost. But I succeeded in securing one cocoon. Very possibly we may yet find that Cecropia larvæ will feed and mature on the leaves of many herbaceous plants.

During the summer of 1883 I had over 50 Cecropia larvæ feeding on a plum tree in my garden. At a short distance grew a peach, the upper branches of which nearly touched those of the plum. On the leaves of this peach I had often placed young cecropia larvæ, invariably they refused to eat and starved to death. Twice I put larvæ about half grown, with the same result.

When the larvæ on the plum were about half grown, a gale of wind blew the branches of the trees together. A few days afterwards I noticed the upper shoots of the peach denuded of leaves. On close inspection I found four cecropia larvæ—having evidently worked over from the plum—feeding greedily and thriving well. These all matured and spun upon the peach.

The horse-chestnut is entered from finding eight cocoons so situated that the larvæ could not have fed on any other tree.

The *Symphoricarpus vulgaris* is entered from one convincing example—the shrub was isolated a long distance from any other shrub or tree—the cocoon was found soon after completion, and several shoots denuded of leaves gave evidence of the presence of the larvæ.

Some doubts have been expressed as to the elm being a food plant. The repeated finding of cocoons, often 30 ft. or more from the ground, seems quite conclusive, but for several seasons I have reared a large number of larvæ on an elm tree in my garden and the only noticeable difference was the generally small size of the cocoons. Cocoons are sometimes found on the common privet, but, although it is most probably a food plant, in absence of sufficient evidence it is omitted from this list.

I have no doubt it will be found that the larvæ feed indiscriminately on all our species of willow and poplar.

In all our northern lumbering sections, a few years after the sweep of a bush fire, you find a dense growth of sambucus birch and willow. Thus, with abundance of food and absence of parasites, this would be the Cecropia's paradise. were it not for the woodpeckers which perforate the cocoons and feed on the pupæ during the winter.

I am indebted to Mr. R. Morey and Mr. W. Squires for valuable assistance in the collection of material for this list.

TANNIN IN CLOVES.

BY W. HODGSON ELLIS, M.A., M.B.

(Read before the Canadian Institute, Nov. 27, 1886.)

Some time ago, while examining cloves adulterated with farinaceous matter, I was struck by the fact, that in testing for starch with solution of iodine, it was necessary to add a considerable quantity of iodine before a blue colour appeared. The quantity of iodine required could even be used as an approximate measure of the quantity of pure cloves in the sample. Some preliminary experiments led me to attribute this action to tannin, and I made, with the assistance of Mr. F. T. Shutt, a number of determinations of tannin in pure cloves by means of Löwenthal's process.

Our manner of working was as follows:—2 grms. cloves were exhausted by boiling under an inverted condenser, filtered, and the filtrate made up to 500 c.c.; 50 c.c. of the filtrate was then titrated with a solution of permanganate (1 grm. to the litre). In 100 c.c. of the filtrate the tannin was precipitated by gelatine and acid salt solution, made up to 250 c.c. filtered, and 50 c.c. titrated with permanganate. Indigo carmine was used as an indicator. The titration was carried out in a porcelain basin. The liquid operated on was diluted to about 750 c.c., and the permanganate was allowed to run into the basin at about the rate of one drop in a second, with constant stirring. The method was essentially that described by Proctor (Chem. News, xxxvi., 58).

We then made determinations of tannin in clove stems and in allspice. I have subsequently, with the assistance of Mr. F. W. Babington, made a number of similar determinations in commercial cloves and allspice, both pure and adulterated. The following table gives our results, stated in c.c. decinormal permanganate, required to oxidize one gram of cloves before and after the precipitation of the tannin. In calculating these results to tannin, I have used Neubauer's factor, viz., 6.3 grm. oxalic acid will require for oxidation as much permanganate as will oxidize 4.157 grm. gallotannic acid. The solution of permanganate used was titrated against oxalic acid and checked by pure tannic acid. In using this factor I do not, of course, intend to assert that the tannin of cloves is identical with gallotannic acid. The factor is only used provisionally to afford a means of comparison.

	C.C. Decinormal Permanganate required to Oxidize one Gram.			Percentage of tannin calculated as gallotannic acid.
	Before the precipitation of the tannin.	After the precipitation of the tannin.	Required for tannin.	
Cloves I	69.54	42.66	26.88	11.17
" II	74.76	49.33	25.43	10.55
" III	74.59	45.35	29.24	12.16
" IV	75.22	46.50	28.72	11.91
Clove stems	37.65	18.86	18.79	7.01
Allspice	24.83	11.33	13.50	5.61
Commercial ground cloves	63.26	39.26	24.00	9.98
Ground cloves adulterated with peas	23.51	15.83	7.68	3.19
Ground cloves adulterated with flour	19.36	12.58	6.78	2.82

It appears from these experiments that cloves contain about 10 or 12 per cent. of tannin calculated as gallotannic acid, that clove stems contain about 8 per cent., and that allspice contains 5 or 6 per cent. of tannin so calculated. It is also evident that the quantity of tannin is a valuable criterion of the quantity of cloves contained in an adulterated sample.

The large quantity of permanganate required by the oxidizable matters other than tannin is remarkable in the case of cloves. It is in every case much larger than that required to oxidize the tannin. I hope to be able to make a further investigation on the nature of these substances at a future time.

The Canadian Institute exchanges with the following Societies and Periodicals:

I.—AMERICA.

(1.)—CANADA.

Canadian Practitioner, Toronto.
Meteorological Reports, Toronto.
Public Library, Toronto.
Education Department, Toronto.
Provincial Board of Health, Toronto.
Publications of the Provincial Government.
Geological and Natural History Survey of Canada, Ottawa.
Parliamentary Library, Ottawa.
Royal Society of Canada, Ottawa.
Ottawa Field Naturalists' Club, Ottawa.
Entomological Society of Ontario, London.
Hamilton Association, Hamilton.
Natural History Society of Montreal.
Literary and Historical Society of Quebec, Quebec.
Le Naturaliste Canadien, Cap Rouge, Que.
Natural History Society of New Brunswick, St. John, N. B.
Nova Scotia Historical Society, Halifax, N. S.
Nova Scotia Institute of Natural Sciences, Halifax, N. S.
Manitoba Historical and Scientific Society, Winnipeg, Man.—19.

(2.)—UNITED STATES.

Bureau of Steam Engineering, Navy Department, Washington, D. C.
Smithsonian Institution, Washington, D. C.
Bureau of Ethnology, Washington, D. C.
United States Geological Survey, Washington, D. C.
Philosophical Society of Washington, Washington, D. C.
United States Coast and Geodetic Survey, Washington, D. C.
United States National Museum, Washington, D. C.
Department of Agriculture (Division of Chemistry), Washington, D. C.
California Academy of Science, San Francisco, Cal.
Technical Society of the Pacific Coast, San Francisco, Cal.
Western Scientist, San Diego, Cal.
Colorado Scientific Society, Denver.
Bridgeport Scientific Society, Bridgeport, Conn.
American Journal of Science, New Haven, Conn.
Connecticut Academy of Arts and Science, New Haven, Conn.
Yale College Observatory, New Haven, Conn.
Georgia Historical Society, Savannah, Ga.
Chicago Historical Society, Chicago.
Illinois State Laboratory of Natural History, Champaign, Ill.

American Antiquarian and Oriental Journal, Chicago, Ill.
Brookville Society of Natural History, Brookville, Ind.
Academy of Natural Sciences, Davenport, Iowa.
State Historical Society of Iowa, Iowa City.
Kansas Historical Society, Topeka.
Kansas Academy of Science, Topeka.
Academy of Natural Sciences, New Orleans, La.
Peabody Institute, Baltimore, Md.
Johns Hopkins University, Baltimore, Md.
United States Naval Institute, Annapolis, Md.
Boston Society of Natural History, Boston, Mass.
American Academy of Arts and Sciences, Boston, Mass.
Observatory of Harvard College, Cambridge, Mass.
Harvard University Library, Cambridge, Mass.
Museum of Comparative Zoölogy at Harvard College, Cambridge, Mass.
Peabody Museum of Archaeology and Ethnology, Cambridge, Mass.
American Association for the Advancement of Science, Cambridge, Mass.
American Society for Psychical Research, Cambridge, Mass.
Essex Institute, Salem, Mass.
Peabody Academy of Science, Salem, Mass.
American Antiquarian Society, Worcester, Mass.
Worcester Society of Antiquity, Worcester, Mass.
Agricultural College, near Lansing, Mich.
Academy of Natural Sciences, Minneapolis.
Geological and Natural History Survey of Minnesota, Minneapolis.
Academy of Sciences, St. Louis, Mo.
Missouri Historical Society, St. Louis, Mo.
Sedalia Natural History Society, Sedalia, Mo.
New Jersey Historical Society, Newark, N. J.
E. M. Museum of Geology and Archaeology, Princeton College, Princeton. N.J.
New York Academy of Sciences, New York.
American Museum of Natural History, Central Park, New York.
American Society of Civil Engineers, New York.
Journal of Speculative Philosophy, New York.
Linnean Society of New York, New York.
New York Microscopical Society, New York.
School of Mines Quarterly, Columbia College, New York.
Magazine of American History, New York.
American Geographical Society, New York.
New York Academy of Anthropology, New York.
American Chemical Society, New York.
Electrical Review, New York.
Electrician and Electrical Engineer, New York.
American Institute of Mining Engineers, New York.
Political Science Quarterly, New York.
New York State Library, Albany, N. Y.

New York State Museum of Natural History, Albany, N. Y.
Buffalo Society of Natural Sciences, Buffalo, N. Y.
Buffalo Historical Society, Buffalo, N. Y.
Cornell University, Ithaca, N. Y.
Vassar Brothers Institute, Poughkeepsie, N. Y.
Oneida Historical Society, Utica, N. Y.
Rensselaer Society of Engineers, Troy, N. Y.
Ohio Mechanics' Institute, Cincinnati, O.
Historical and Philosophical Society of Ohio, Cincinnati, O.
Cincinnati Society of Natural History, Cincinnati, O.
Denison University, Laboratories of Biology and Natural History, Granville, O.
University of Pennsylvania, Philadelphia.
American Catholic Quarterly Review, Philadelphia.
American Naturalist, Philadelphia.
American Philosophical Society, Philadelphia.
Academy of Natural Sciences of Philadelphia, Philadelphia.
Franklin Institute of the State of Pennsylvania, Philadelphia.
Historical Society of Pennsylvania, Philadelphia.
Wyoming Historical and Geological Society, Wilkesbarre, Pa.
Rhode Island Historical Society, Providence, R. I.
Newport Natural History Society, Newport, R. I.
University of Virginia.
Wisconsin Academy of Sciences, Arts, and Letters, Madison.
State Historical Society of Wisconsin, Madison.—89.

(3.)—MEXICO.

Museo Nacional de México.—1.

(4.)—CUBA.

La Sociedad Antropologica de la Isla de Cuba.—1.

(5.)—SOUTH AMERICA.

Instituto Historico, Geographico, e Ethnographico do Brazil, Rio de Janeiro.
Annaes da Escola de Minas de Ouro Preto.
Sociedade de Geographia de Lisboa no Brazil.
Academia Nacional de Ciencias en Córdoba (Republica Argentina).—4.

II.—EUROPE.

(1.)—GREAT BRITAIN AND IRELAND.

ENGLAND.

Birmingham Natural History and Microscopical Society.
Journal of Microscopy and Natural Science, Bath.
The Scientific Enquirer, Bath.
Cambridge Philological Society.
Cambridge Philosophical Society.
Royal Geological Society of Cornwall, Penzance.
Literary and Philosophical Society of Leeds.

Literary and Philosophical Society of Liverpool.
Liverpool Astronomical Society.
Liverpool Polytechnic Society.
Royal Geographical Society, London.
Royal Astronomical Society, London.
Royal Microscopical Society, London.
Royal Society, London.
Victoria Institute, London.
Quekett Microscopical Club, London.
Society for Psychical Research, London.
Anthropological Institute of Great Britain and Ireland, London.
Royal Colonial Institute, London.
Linnean Society of London.
London Mathematical Society, London.
Institution of Civil Engineers, London.
Financial Reform Association, London.
British Museum, London.
British Museum, Natural History Section, London.
Palestine Exploration Fund, London.
Patent Office, London.
Trübner's American, European, and Oriental Literary Record, London.
Physical Society of London.
National Association for the Advancement of Social Science, London.
The Sanitary Institute of Great Britain, London.
The Chemical News, London.
Royal Antiquarian Society, London.
Meteorological Office, London.
Literary and Philosophical Society of Manchester.
Manchester Geological Society, Manchester.
Manchester Association of Employers, Foremen, and Draughtsmen of the Mechanical Trades of Great Britain.
Society of Antiquaries of Newcastle-upon-Tyne.
Somersetshire Archæological and Natural History Society.—39.

SCOTLAND.

Royal Society of Edinburgh.
Royal Society of Antiquaries.
Royal Scottish Society of Arts.
Royal Physical Society.
Edinburgh Botanical Society.
Edinburgh Geological Society.
Scottish Geographical Society.
Royal Philosophical Society, Glasgow.
Glasgow Geological Society, Glasgow.
Natural History Society of Glasgow.
Institution of Engineers and Shipbuilders of Scotland.—11.

IRELAND.

Royal Irish Academy, Dublin.
Royal Dublin Society, Dublin.
Royal Geological Society of Ireland, Dublin.
The Institution of Civil Engineers of Ireland.
Naturalists' Field Club, Belfast.
Belfast Natural History and Philosophical Society.—6.

(2.)—AUSTRIA-HUNGARY.

Siebenbürgischer Verein für Naturwissenschaften in Hermannstadt.
K. Böhmische Gesellschaft der Wissenschaften, Prag.
K. K. Universitäts-Sternwarte, Prag.
Naturhistorischer Verein "Lotos," Prag.
Civico Museo di Storia Naturale di Trieste.
K. K. Geologische Reichsanstalt, Wien.
K. K. Geographische Gesellschaft, Wien.
K. K. Zoologisch Botanische Gesellschaft.
K. K. Naturhistorisches Hofmuseum.
K. K. Central Anstalt für Meteorologie und Erd-Magnetismus.
Anthropologische Gesellschaft in Wien.
Wissenschaftlicher Club in Wien.
Oesterreichischer Ingenieur-und Architekten Verein, Wien.
Ornithologischer Verein, Wien.—14.

(3.)—BELGIUM.

Académie Royale des Sciences, des Lettres et des Beaux Arts de Belgique.
Société Royale de Botanique de Belgique.
Société Royale Belge de Géographie.
Musée Royal d'Histoire Naturelle de Belgique.—4.

(4.)—DENMARK.

Kongelige Bibliotheket.
Kongelige Danske Videnskabernes Selskab.
Kongelige Nordiske Oldskrift Selskab.
Nordisk Tidskrift for Filologi.—4.

(5.)—FRANCE.

Académie Nationale des Sciences, Arts et Belles-Lettres de Caen.
Société Nationale des Sciences de Cherbourg.
Société Géologique de Normandie.
Société Géologique du Nord.
Société pour l'Étude des Langues Romanes, Montpellier.
Académie des Sciences, Inscriptions et Belles-Lettres de Toulouse.
Annales des Mines, Paris.
Annales des Ponts et Chaussées, Paris.
Société des Ingénieurs Civils, Paris.
Société Nationale des Antiquaires de France, Paris.
Société Géologique de France, Paris.

Société Académique Indo-Chinoise de France, Paris.
Société d'Ethnographie, Paris.
Société Américaine de France, Paris.
Société d'Anthropologie de Paris, Paris.
Bibliothèque Nationale, Paris.
Société de Géographie, Paris.
Cosmos, Paris.
L'Électricité, Paris.
Association Française pour l'Avancement des Sciences, Paris.
Journal des Sociétés Scientifiques, Paris.
Revue de Linguistique et de Philologie Comparée, Paris.
Société Zoologique de France, Paris.
Société Mathématique de France, Paris.
Bulletin d'Histoire Ecclésiastique et d'Archéologie Religieuse des Diocèses de Valence, Digne, Gap, Grenoble, et Viviers.—22.

ALGERIA.

Société de Géographie et d'Archéologie de la Province d'Oran.
Académie d'Hippone.—2.

(6.)—GERMANY.

Königliche Preussische Akademie der Wissenschaften, Berlin.
Gesellschaft Naturforschender Freunde, Berlin.
Gesellschaft für Erdkunde, Berlin.
Berliner Gesellschaft für Anthropologie, Ethnologie und Urgeschichte, Berlin.
Bibliographie der Staats-und Rechtswissenschaften, Berlin.
Archiv der Mathematik und Physik, Berlin.
Naturhistorischer Verein für die Preussischen Rheinlande und Westphalen, Bonn.
Naturwissenschaftlicher Verein, Bremen.
Naturwissenschaftlicher Verein "Isis," Dresden.
Senckenbergische Naturforschende Gesellschaft, Frankfurt-am-Main.
Naturwissenschaftlicher Verein, Frankfurt-an-der-Oder.
Oberhessische Gesellschaft für Natur-und Heilkunde, Giessen.
Königliche Gesellschaft der Wissenschaften, Göttingen.
Naturwissenschaftlicher Verein, Hamburg.
Verein für Naturwissenschaftliche Unterhaltung, Hamburg.
Naturhistorisches Museum zu Hamburg, Hamburg.
Geographische Gesellschaft, Hannover.
Naturhistorischer Verein für Niedersachsen, Hannover.
Historischer Verein für Niedersachsen, Hannover.
Naturhistorisch-Medicinischer Verein, Heidelberg.
Verein für Naturkunde, Kassel.
Ostpreussische Physikalisch-Oekonomische Gesellschaft zu Königsberg.
Naturforschende Gesellschaft zu Leipzig.
Königlich Sächsische Gesellschaft der Wissenschaften zu Leipzig.
Verein für Vaterländische Naturkunde in Würtemberg.
Naturhistorische Gesellschaft zu Nürnberg.

Königlich Baierische Akademie der Wissenschaften, München.

Deutsche Gesellschaft für Anthropologie, Ethnologie und Urgeschichte, München.

Görres Gesellschaft (Historisches Jahrbuch), München.

Verein für Naturkunde, Offenbach-am-Main.

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